FOOD INDUSTRIES

manufacturing and processing

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Quality Still Controls

TO THE production man the three types of merger most frequently discussed are of substantially equal import. To the extent that they increase output all mergers—horizontal, vertical, circular—tend to create operating economies, the ultimate desideratum being the optimum ratio of output to equipment and personnel. Further than this no magnification can go, and it should be borne in mind that in many of the food industries optimum operating conditions are to be found in relatively small units.

. . . NATURALLY, this ratio depends upon product, the individual shop, and other factors that soon come to light when quantity production is analyzed. Overloading a shop that is running at its most effective rate cannot but cause trouble. Nor is it always a simple matter to establish duplicate units of similar effectiveness, which is the logical procedure whereby most food industries assume responsibility for permanently augmented output.

. . . FEW MERGERS of the sort that effect economies by the consolidation of hitherto separate concerns making the same item, termed "horizontal," originate in the production department. Such action is palpably in the interests of less expensive selling and often produces notable economies therein. The chief task of the production manager in amalgamations of this sort is that of maintaining the integrity of the product.

. . . OF THE vertical merger, in which manufacture is joined with distribution, the originating impulse may well, and often does, come from the production department. By this means quality of raw material may be standardized at any specified level of quality, a feature of outstanding importance in its later fabrication. Here quality of product is seldom debased. On the other hand, mergers of this sort not infrequently are disappointing in that they fail to produce the economies expected.

. . . THE so-called circular merger, or combination of specialty units making supplementary products appropriate to joint distribution, obviously is assembled from the sales viewpoint. In this case quality of product should be uppermost in the executive mind—first, foremost, and all the time. As to integrity of product, protestations must be made effective by good works.

. . . THOSE concerned with the manufacture of foods, whether in merged establishments or elsewhere, should be ever mindful of the predominating importance of the quality of product. The fact that distribution is being given constantly increasing attention must not be taken to mean that the importance of proper manufacture may be minimized. That way leads to a destruction that will be as painful as it will be prompt.

IN THE present movement directed toward economy of effort, FOOD INDUSTRIES approves the elimination of unnecessary marketing organization. It favors the replacement of inefficient small units by larger groups, properly co-ordinated and well managed, with ample provision for technical research looking toward future betterment of product.

Container Simplification Makes Notable Progress

HAND IN HAND with the fast-growing habit of packaging foods in relatively small units—the special theme to which this issue of FOOD INDUSTRIES is principally devoted—goes the topic of size simplification, which has been an important element in the economic reconstruction undertaken by the Department of Commerce for the post-War rehabilitation of industry. Lowered cost of both production and distribution, reduced investment in idle stocks of goods ready for the market, and quicker and better service for the customers have all proved to be practicable of realization through this movement.

Many of the food industries have been making splendid progress with their simplification programs, a notable advance having been made during the past year. Ice cream, carbonated beverages, preserves and apple butter, coffee, dried fruit, Maraschino cherries, mayonnaise, vegetable shortening, and a score of other food commodities, ranging in necessity from ice cakes to pop, have proved amenable to this treatment. Apparently every industry that has undertaken a simplification program is well pleased with the results obtained. Elsewhere in this issue is a full discussion of this topic, presented by one of the Bureau of Standards staff who has been instrumental in the progress of 1929.

Any branch of the food business that is not availing itself of this economic method is needlessly delaying its own progress. Great as has been the progress of 1929, we anticipate still greater benefits in 1930 from this movement.

Pending Federal Legislation Of Especial Significance

LEGISLATION affecting the food industries is always important, and the prospect for the present session of the federal Congress offers no exception to this rule. There have already been introduced at least a half dozen bills of considerable moment to the food industries, and others of equal significance are likely to be forthcoming.

One of the most significant trends in food manufacturing is reflected by two bills, one sponsored by the National Canners' Association and the other by the National Preservers' Association, each asking for further authority to be given to the Department of Agriculture in the regulation of their types of products. Senator McNary has introduced S. 1133, which, if enacted, would authorize the department to formulate standards for canned fruits and vegetables. The bill of Senator Jones (S. 880) provides for the control and proper labeling of jams, jellies, apple butter, and the like, containing added pectin. In both cases the associations sponsoring this legislation on their own initiative want the federal authorities to regulate this phase of their business as a protection to honest manufacture against shyster competition. It is not unlikely that both bills will pass during the coming session, as the backing of the interested industries is likely to result in favorable consideration by both houses of Congress.

The slack-filling bill (H.R. 8), which would eliminate containers of deceptive proportions as well as partially filled packages, has trade support as well as the Department of Agriculture's approval. This bill has passed the House of Representatives several times, but not the Senate. There seems to be a fairly general feeling that the bill is highly desirable, even though some of the evil has been overcome through trade practice agreements formulated under the Federal Trade Commission.

Two new trends in food regulation are reflected in the Smoot bill (S. 1468), which proposes to put tobacco under the Food and Drugs Act and to forbid false and deceptive advertising. This has previously been reviewed in the editorial columns of FOOD INDUSTRIES; and it still deserves the characterization of legislation apparently inspired by the sugar interests of the country in retaliation against certain cigarette advertising practices of the past year. The other new type of legislation, which is also of uncertain prospect, relates to the inspection of poultry killing and poultry products making. There are two bills, one by Representative Lea, of California (H.R. 146), and one by Representative Sirovich (H.R. 1202), which attack this problem from different points of view, but with the same general purpose of cleaning up the poultry products business.

The competition of foreign-grown foodstuffs has inspired Senator Shortridge and Representative Swing to introduce S. 902 and the companion House bill. This bill would require the declaration on the label of the fact that the contained vegetable material or the vegetable material from which packaged goods are made was grown outside of the United States if this were the case. This marking is intended to check the use, for example, in the walnut business, of the phrase on the label "packed in California" when the goods so packed in that state actually were foreign-grown nuts. California growers claim that inferior nuts from Asiatic sources so labeled are detrimental to the California industry because of their less desirable flavor, creating an unfavorable reputation for California nuts.

The most bitter controversy of the coming Congress affecting foods undoubtedly will be the renewed fight over the corn sugar bill. This has been characterized by all manner of strong language, both favorable and unfavorable. The import of this bill is to gain for corn sugar the same legal status that it enjoys in connection with confectionery, baked goods, and ice cream, in all of which it may be employed freely without formal declaration of its presence.

At present all other food products are deemed misbranded if they contain undeclared dextrose. Abortive attempts to sell jellies "sweetened with dextrose" apparently have persuaded the corn products people that it is easier to alter the laws of the land than to extirpate what they regard as prejudice born of ignorance.

Those who oppose the bill believe that explicit exclusion of dextrose from the category of materials the presence of which must be recited on the label, will open wide the door to fraudulent practices in connection with such products as honey and maple sirup, to the detriment not of our digestive apparatus—for dextrose is as wholesome as any other form of sugar—but of our pocketbooks. It is around these points that the controversy as to the significance of the bill will center.

There is no doubt that food manufacturers of all types should consider carefully these and other items of pending legislation. No other group of industries is charged more directly with the responsibility of protect-

of Recent Progress

ing the public welfare. Far-seeing and broad-minded leaders of our industry are a unit in desiring the fullest possible co-operation between the government and industry. The public interest is, and always should be, the first and determining test of the desirability of food legislation. No branch of our industry can afford even to appear to desire to obtain its profits at the expense of public disadvantage, or even of so minor a thing as slightly misleading the public as to the character or quality of goods that are offered. There will be considerable opportunity early in 1930 to press these fundamentals of sound public relations with reference to federal legislation.

New England of Today

TO ONE interested primarily in food manufacture, New England presents an odd contrast, for very little raw material for food manufacture is produced in that section, as compared with the actual local manufacture of foods. Food is an industry of considerable size, despite the scarcity of locally produced supplies. As an example of this contrast may be cited the one flour mill at Concord, N. H. It is the only primary source of flour in the six states east of the Hudson River, and yet New England abounds in bakeries. Such an industrial community offers a great consuming market for foods—both primary and manufactured—from all the agricultural sections of the country, for food manufacture is subordinated to the other activities in that community where manufacturing is concerned primarily with the production of commodities other than foodstuffs.

Haphazard knowledge of New England—chiefly, it is suspected, a hold-over from half-learned geography lessons of our youth—received important corrections and additions by first-hand observation on a recent tour. In the company of twenty other McGraw-Hill editors, a thousand-mile bus trip was taken through the industrial sections of that region. The invitation of the New England Council to make this trip, to see what New England actually does, afforded a remarkable opportunity for a swift survey of its multifarious activities. It was accomplished in a manner that would be quite impossible for one person acting alone.

Thus the erroneous preconception that the textile industry dominated the commercial pursuits of New England gave way to the realization that the outstanding feature is more to be regarded as the group of metal-working trades. A belief that abundant water power was the basis of New England prosperity has given way to the broader understanding that a huge reservoir of skilled mechanics of the highest order is New England's greatest asset. And it was found that not all this skill was confined to old New England stock, for more than once one heard jests such as, "Yes, we Chicago Yankees are pretty clever."

New England's future development will lie in the greater utilization of the reservoir of skill that reposes in her population. Her location far distant from the geographical center of the country makes it logical to expect that the production of goods embodying the minimum of material fabricated with the maximum of human and mechanical skill will be the way to further success. Craftsmanship does not carry a freight charge.

No New England community laid any claim to predominance in any one field of manufacture but, on the contrary, her business men stressed the diversification of industry and pointed out that the economic evil of the one-industry town has been corrected to the point that depression in any line of endeavor cannot seriously affect the prosperity of the whole. Such an enviable situation has been the result of conscious effort. The chamber of commerce is at its best in New England, for when new industries are sought it is always a non-competing industry that receives the invitation to come to a city.

If there is a lesson to be learned from this two-weeks' tour of inspection of sixty-eight plants and forty cities that will be of value to the food industries it is that here is a market of increasing stability—a market that, once captured, will always be good.

Food Mergers and the Stock Market

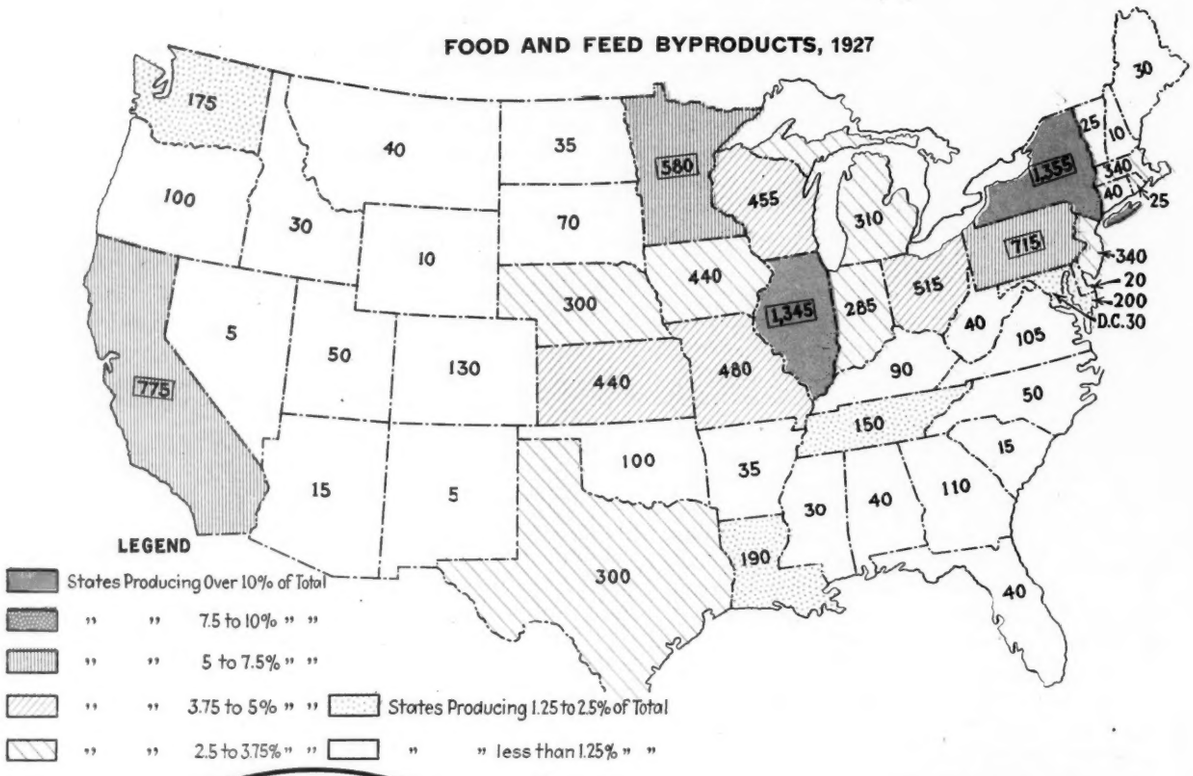
MERGERS, reorganizations, and expansion have been the order of the day during 1929, and the food industries have not escaped the infection. It is perhaps futile to attempt discussion by generalities of the industrial problems of recent origin and the consequences of stock-market booms and collapses, but there are some specific problems within our industries that deserve the thoughtful attention of executives and technical men, of both the merged and the unmerged companies.

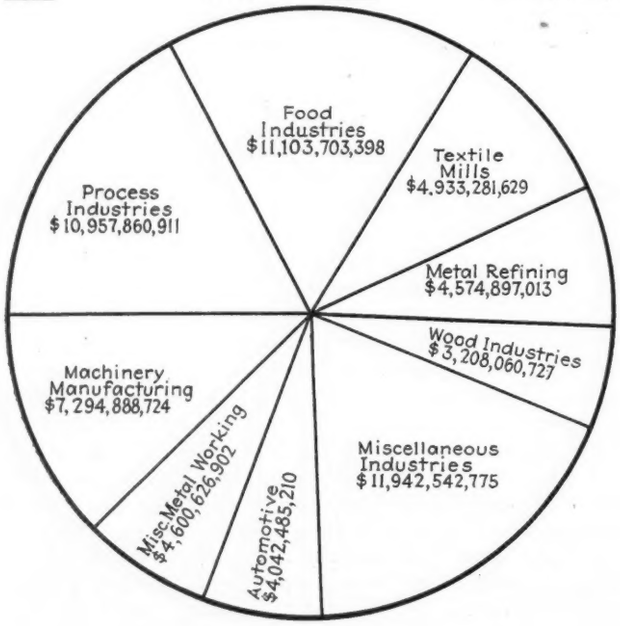
Some recent consolidations have been on a sound economic basis. Others have a much less evident economic justification. There have been vertical, horizontal, circular, and all other varieties of consolidations, some with obvious merit and some seemingly of doubtful usefulness. Nor will the real test of economic validity be found in possible appreciation of capital stock values. The true test of success will be net earnings over a considerable period after combination, as compared with the aggregate of net earnings of the previously separate corporations. Especially in the food business will it be important to watch records of earnings much more closely, for, if time indicates the proper trends in net income, the executive may safely be indifferent to stock-market appraisal.

But even with seemingly sound combinations there arises the question as to whether in the food industries we have not formed too many combinations, made them too large, encouraged too rapid growth, or overcapitalized too heavily asset values of intangible nature. Big factories may permit efficient operation, may lower overhead, and may ultimately give attractive trends in earnings. But with magnitude come increased obligations as well as increased opportunities; and always there will be the possibility of creating a machine that is so unwieldy as to exceed the capabilities of available executives accurately to steer and efficiently to operate.

In this connection FOOD INDUSTRIES counsels caution; we urge that progress be made sanely and slowly. Newly acquired subsidiaries cannot be absorbed in a moment, nor may several separate corporations be welded instantaneously into a single loss-tight machine. Let there be further progress in 1930, but let us be sure that it is progress and not mere change that is taking place.

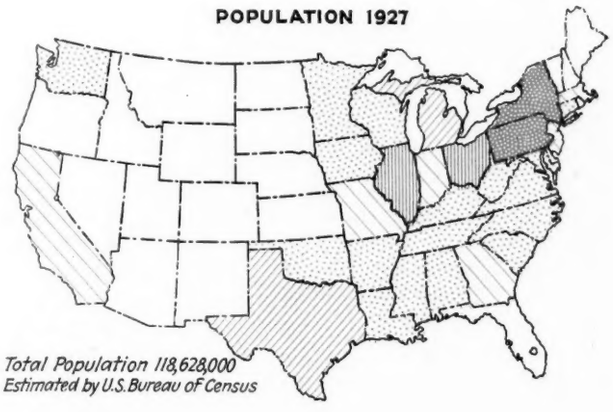
Where Food Products A





ALL INDUSTRIES
Total $62,718,347,289

VALUES of food and feed byproducts are given in millions of dollars, expressed to nearest 5 million, from data of U. S. Census of Manufactures, except California, Maryland, North Carolina and Texas, which are in part estimated by FOOD INDUSTRIES. Money total is $11,015,000,000, excluding non-food byproducts; including all byproducts, the total is $11,103,000.000.



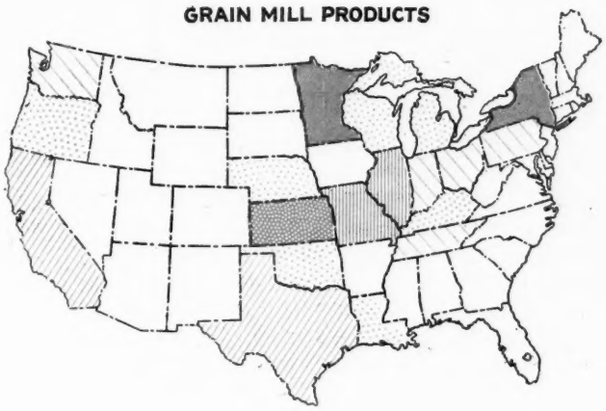
Total Population 118,628,000
Estimated by U.S. Bureau of Census

Total Corporation Taxes $1,304,146,407

cts Are Made and Consumed

Food Production in Total and in Certain Major Branches Compared With Population and U. S. Corporation Taxes

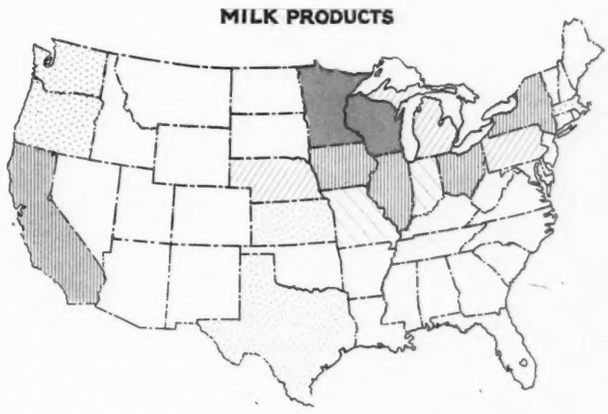
GRAIN MILL PRODUCTS



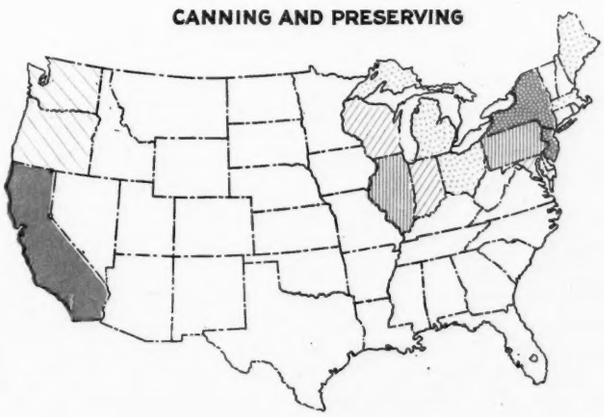
BREAD AND BAKERY PRODUCTS

MEAT AND MEAT PACKING

MILK PRODUCTS



CANNING AND PRESERVING



CONFECTIONERY

A Federation of Food Associations—Its Advantages and Disadvantages

CO-ORDINATION and co-operation within the great group of food industries have naturally occurred to many as an important possibility. In this day of trade association development it seems inevitable that sooner or later there should be established some plan for effective co-operative effort among the twenty or more groups of food producers, which work now through a still greater number of separate trade and technical bodies. In the main, these several groups have highly diverse interests, but they also have in common certain problems of great moment, and on these common problems there is opportunity for joint effort.

Any proposal to the effect that there should be an actual merger in which the present associations would lose their individual identity is obviously unwise, yet it appears entirely practicable to obtain every useful result which might come from such a merger, without the accompanying disadvantages, through a federation of societies that would function as a meeting place and clearing house and not as a super-association giant.

In the fields of uniform cost accounting, simplification and standardization, credit risks, traffic rates, and inter-industry arbitration there are many common problems, and in connection therewith the benefit from expression of joint opinion and the mutual exchange of ideas in the spirit of real co-operation undoubtedly would be highly beneficial to all parties. Lesser opportunity exists for effective joint action in the important fields of trade relations and promotion. Certain types of research, on the other hand, might well be accelerated by a national federation. Certainly its co-ordinating influence would be helpful in avoiding duplication of effort and work at cross-purposes. In short, there must be a balancing of advantages and disadvantages before such a move gets under way—yet this very process is going to be helpful in defining and strengthening the group.

FOOD INDUSTRIES urges that during 1930 there should be serious thought given to questions of inter-industry and inter-association co-operation. Before the year has closed it may well be that some sound scheme can be developed for bringing together representatives of each association to discuss the problems common to all. Such an accomplishment would mark 1930 as a red-letter year of achievement in food association progress.

Louisville Vignettes—No. 1

EVEN though much of the statistical data developed by the Louisville Grocery Survey is yet to be compiled, and probably will not be available for publication for some months to come, it is most gratifying to note that already some definite reactions can be recorded as the direct results of the one bulletin that has been distributed.

Manufacturers of food products, if they be wise, will maintain a wholesome state of balance between business originating from chains and that coming from independent outlets, and to accomplish this they need prosperous independent wholesalers. One lesson that can be learned from the Louisville survey is that to be prosperous the wholesaler must demand that his credit department refuse credit to any buyer whose ability to pay is justly doubted.

It is not difficult to imagine just how such procedure will affect the earning statement of a certain wholesaler who first studied all the accounts on his books and then applied the remedy that the Louisville findings suggested to him. He took the proverbial bull by the horns and cut off over three hundred slow and doubtful accounts, although they represented twelve per cent of his total sales volume. With more time for his good customers he has increased his sales eleven per cent over the same period last year.

Obviously that wholesaler is going to become a bigger and better outlet for the manufacturer whose goods he handles.

Self-Regulation Starts; Whither Does It Lead?

"SELF-REGULATION IN INDUSTRY" has made momentous progress during the past year. There have been more trade-practice conferences and more stipulations of approved methods affecting the food industries made in co-operation with the Federal Trade Commission during the past twelve months than during all previous time. Thus the food manufacturing and the food merchandising groups have embarked upon a course that undertakes to give self-regulation without the necessity of governmental intervention. This is a splendid sign. But it is merely a sign that points the present course along the industrial road. It does not in itself prove the destination.

The highway of trade practice is broad and from it there turn off many innocent appearing byways, even some impressive looking alternate routes. It will not be easy to keep all of the trade organizations or all members of any given industry safely upon the straight course of ethical and fair competition. Many will turn aside, lured by attractive variations of practice which seem to lead to profit, immediate or future. Others may even stealthily slip backward and pass along the old roads of unfair practice, secret rebating, and illegal procedures to defeat competition. The serious question which 1929 leaves for 1930 is: Who is to police our new trade route?

It has been said by those who have made a careful study of trade practices that there has not yet been a single trade-practice code which has been proved to be thoroughly enforceable during times of industrial stress. We hope that this will not long continue to be the case. It is evident that there still remains to be formulated a federal policing agency to enforce on recalcitrant members the rules adopted by each industry as a whole, unless the industries themselves shall find some self-policing scheme to supplement their first efforts in self-regulation. It will be a splendid achievement if the policing as well as the adoption of codes can be undertaken by industrial groups themselves.

Recognizing the seriousness of the problem, the National Fertilizer Association, among others, has undertaken to set up a more or less automatic procedure by which violations of accepted trade practices may promptly be arrested. It proposes that in each district of the country there shall be a group representing both

association members and non-members, the duties of which shall be to investigate any serious, formal complaints of code violation that the headquarters of the association finds it impracticable to settle informally. After proper consideration, if adjustment cannot be reached through this procedure, or if either the complainant or the defendant refuses to accept the findings, it is proposed that the matter be referred to a general trade practice committee for consideration. If this action shall in turn fail, it is planned that the board of directors of the association then shall determine whether the Federal Trade Commission or other federal agency shall be requested to take official notice of the situation and undertake the legal steps necessary to insure trade compliance with rules that have been generally accepted.

It is still too early to say whether the particular scheme adopted by the fertilizer industry is going to work well in that business; and it is still more difficult to forecast whether, even if it works well there, it should be applied in the same fashion in the food industries. At the moment it seems safe to conclude only that the seriousness of the problem is recognized and its solution is being attacked vigorously by a number of groups. It is to be hoped that 1930 will disclose methods by which enforcement and policing of trade codes may be achieved.

Industrial Utilization Of Agricultural Materials

FARM RELIEF by congressional legislation has attained great political importance, but so far has had little direct effect. Developments of quite another sort, proceeding along sound lines and recognizing basic economic law, have, however, made a substantial contribution to the solution of some of our farm problems. We refer to the steady and significant increase in the industrial use of agricultural materials, notably through processing in the food industries.

Although progress has not been made uniformly during all of the last decade, there has been a recent surprisingly large advance in the processing and manufacture of foodstuffs; and the value of these products from American industry now approaches the entire gross income from the sale of all classes of farm products, including grains, animals, cotton, wool, and all the rest of the farm commodities. As recently as 1919 the value of marketed farm production was 27 per cent greater than the factory value of manufactured and processed foods. By 1923 farm values exceeded factory values by only 22 per cent. In 1927 they had the narrow margin of 11 per cent. We venture the guess that in 1929 the value at the factory of food products was almost as great as the value at the farm of all of its marketed production.

It should not be thought that this growth in importance has taken place at the expense of agriculture. Quite the contrary is true. Without this growing utilization in industry of many of the products of our farms there would have been even greater distress and much less rapid recovery than has been experienced. Today the food factory absorbs farm surpluses. It cans, preserves, or processes them to forms that can be shipped long distances and stored long periods without deterioration, thereby eliminating much wastage formerly due to the want of market. The producer and the consumer—indeed, the entire nation—are rendered an economic service of incalculable value.

This fact is most significant in illustrating the growing national importance of the food industries. Certainly this group, which yields products valued at as much as the entire farm output of the country, is entitled to constantly increasing respect.

New Problems for New Times In Food Inspection

INSPECTION and regulation of foods by the federal government proceeded during 1929 along the conventional lines, but with increased emphasis on the desire of the federal officials to co-operate with the industries concerned, to the end that, so far as was possible, actual seizures and prosecutions might be eliminated. It is notable that a very large percentage of the foods now receiving attention by the inspection authorities are subject to seizure or criticism because of bad labeling practice rather than because the food contained in the package is inherently either unwholesome or unmarketable. Also, the federal officials find much, if not most, of their difficulty with newcomers in the food industries. They comment favorably upon the most cordial co-operation given by the existing industry and make note of the fact that it is those who have not understood the law at the outset who introduce most of the problems. However, there are other equally serious developments which have come about because of new fads or incident to consumer fancies.

During the past year the increasing interest in bran content of cereals, the public desire for vitamin-containing foods, the popularity of soft cheese, and similar domestic-science fads have created a pressure upon food producers that has led some concerns to yield to the temptation for profit in matters that are illegal. It is not amiss at this time to suggest that when such new fads come, the manufacturer of food products must carefully consider legal as well as popular aspects of the development in order to avoid embarrassment of seizure or controversy with federal officers.

Several definitions of important foodstuffs were issued during the year by the committee on food standards. These included, among others, definitions of milks of various sorts, pasteurization; coffee; mayonnaise dressing; whole wheat and graham flour; grape, orange, and other fruit juices; grain meal; ginger ale and other soft drinks; and an additional group on which final action is expected soon. In this field it is notable that there is a constantly increasing number of food definitions made at the request of the interested industries. Clearly it is becoming evident to food manufacturers that one of the best defenses against unfair competition is to have so clear a definition of quality of product as to prevent misbranding by any but the utterly unscrupulous.

It seems that in so far as generalization is possible over the broad field of the food industries, 1929 must be written down as a year of increased co-operation between government and industry. This is as it should be. All will hope that 1930 can be similarly classified.

Hand preparation tables at California Canneries Company, San Francisco

CALIFORNIA CANNERIES DEVELOP

Efficient Systems of Materials Handling

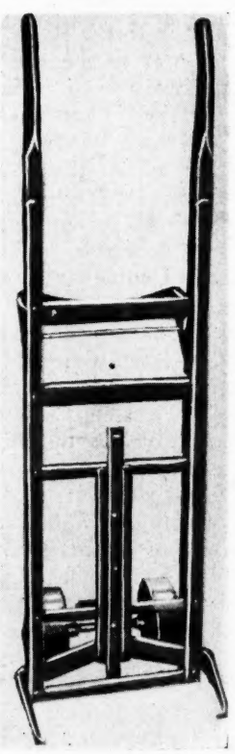
By EARL D. STEWART
Assistant Editor

DEVELOPING a system of materials handling in a food manufacturing plant is easy or difficult, depending on the physical properties of the materials to be handled. Fluids—milk, sirup, brine, vinegar—present little or no difficulty, mechanically, aside from possible corrosion problems. Small, hard substances of more or less regular shape, such as the grains, that in the mass possess some of the properties of fluids, likewise can be marched steadily through a plant with little or no hand labor. Large units, such as sides of beef or whole hogs, with a high value per unit, are handled by overhead conveyors easily and economically even though a great many hand operations are performed on each piece.

Cannery handling methods present a somewhat different and more difficult problem, in which many factors must be considered. Units of raw material vary in size from the pea to the pineapple; in shape from the round ball of the peach to the shapelessness of spinach; and in consistency from the firm peach to the mushy tomato. For some raw materials many hand operations are necessary, as, for example, asparagus, apricots, peaches and pears. Others, such as peas or corn, can be handled almost entirely by machines. Evidently a single system will hardly suffice for all, nor could a complete description of the methods of handling in the entire industry be encompassed in a few pages. By limiting the discussion to some of the methods used in handling peaches, pears and apricots, and empty and filled cans, a more detailed treatment is possible.

In order to state clearly the handling problems involved, assume that a canning factory to pack apricots, peaches and pears is to be built. Certain standard equipment is available, such as the lye peeler, and its accessories; washer; blancher; size grader; slicing machines; siruper; exhaust box; can-sealing machines; cooker; cooler. Also a source of supply of cans to be received in cars alongeside the plant is available. All of this equipment can be leased or purchased outright. No ingenuity other than that required to place it efficiently with respect to the factory floor plan is required. A further assumption is that pitting the apricots and peaches, peeling and coring the pears, and filling the cans are hand operations to be paid for on the piece-work basis.

Fig. 1—A two-wheeled clamp truck



The specific materials handling problems will involve:

1. Moving the fruit from unloading platform to preparation tables.
2. Moving pitted peaches and apricots from preparation tables to lye peeler or size grader.
3. Distributing fruit, peeled and graded for size and quality, to the canning tables.
4. Moving empty cans to the canning tables.

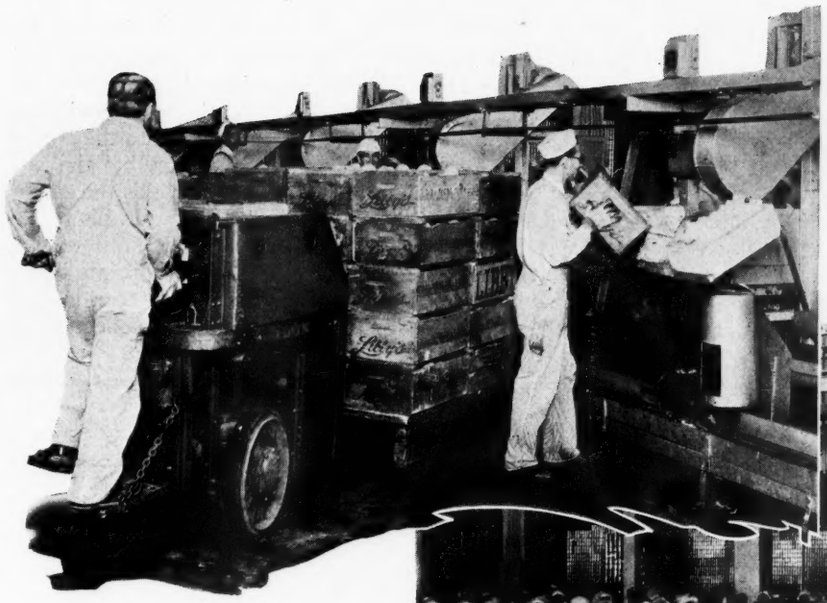


Fig. 2—Bringing the peaches to the pitters at Libby's, Sacramento. A fresh skidful is being delivered while the workman is dumping one box. The belt conveyor above his head carries the empty box to the box washer. Another belt conveyor along the floor removes the pits.

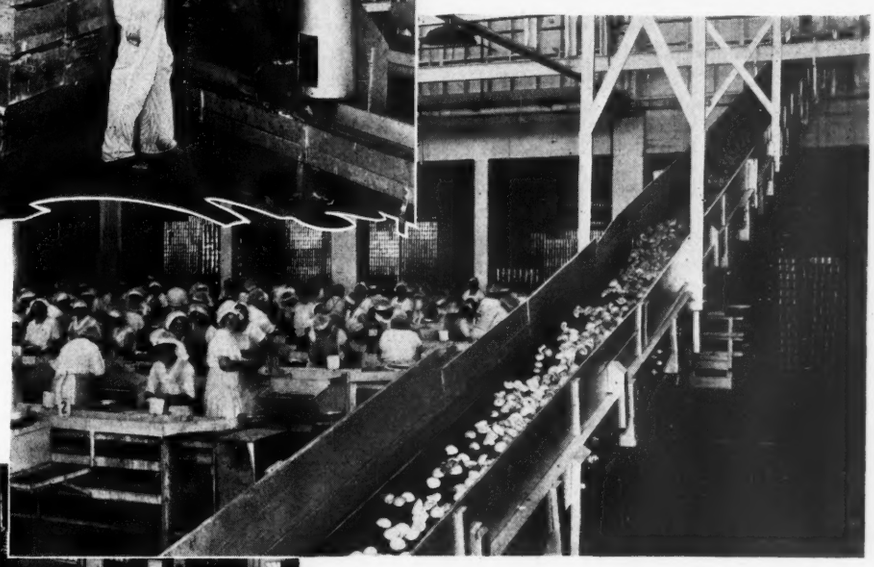


Fig. 3—An inclined belt conveyor at Libby's, Sacramento, carries the pitted halves to the peeler on the second floor.

Fig. 4—Two-belt system in use at Libby's Sacramento preparation department. Worker 23 will receive the box of peaches moving down the conveyor.

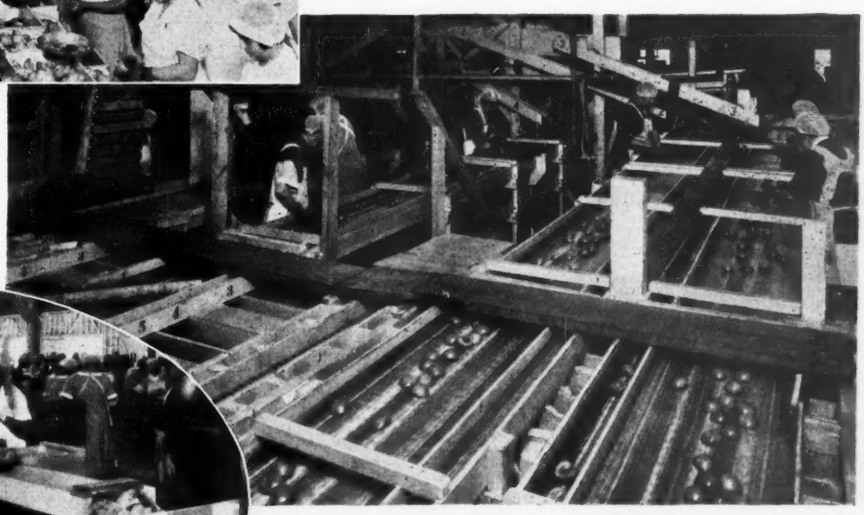


Fig. 5—Below is shown the simple conveyor system in the preparation department of the California Co-operative Producers, Oakland. The "duck boards" at the left are on the floor when the belt is in use.

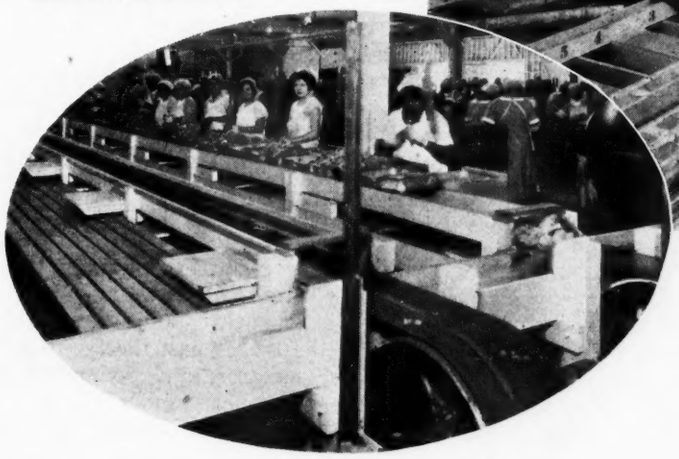


Fig. 6—Above, the workers are sorting peaches after size grading. Slicing halves are dropped into a chute next to the worker which leads to the lower run of the belt. Pie fruit is placed in the narrow part at the back. The same belt is used for sorting either pears or peaches, although not simultaneously.

5. Moving filled cans from fillers to the siruping machines.

6. Supplying the siruping machines with sirup of the proper density.

7. Moving filled and sealed cans from cooler to warehouse.

The solution that first occurs is that all of these operations (except the sixth) can be carried out by laborers with trucks. Of course, some consideration must be given to the type of truck and the receptacles for the material to be handled. Two-wheeled trucks would be satisfactory for transferring boxes of fruit from freight cars or motor truck to preparation tables, and also from preparation tables to the peeler, in the case of peaches, and to canning tables, in the case of pears. Another simple solution would be to allow the different sizes of peach halves to run from the grader onto tables for hand-sorting into sound, slicing and pie fruit, assuming that this has not been done before grading them for size. Owing to the large capacity of the lye peeler it is evident that a jam is likely to occur here, if certain sizes run heavy or if the operators, known as pitters, make a sudden spurt to clean up for the day.

Apparently the first impetus to some method of mechanical handling was given at this point. Although trucking operations could carry the slices, halves, and pie fruit to the canning tables as well as the empty cans, and although the filled cans could be trucked to the sirupers and the sealed cans to the warehouse, with proper consideration as to the receptacles for the cans and the type of truck on which to carry them, no factory is quite as primitive in its development as the one here pictured. On the other hand, none that has been visited is completely equipped with labor-saving conveying and handling methods. Some of the possible reasons for this will be discussed later.

Attention to rapid methods of handling seems first to have been given to moving the fruit through the peeler, grader, and slicers to the canning tables. All plants studied had some mechanical means of conveying the fruit through these machines and distributing it to the canning tables. Also, all factories used the same simple, sirup system of elevated tanks, with pipes leading to a manifold above the siruping machines and a hose from the manifold to siruper.

To move fruit from freight car or motor truck to preparation tables most factories use two-wheeled clamp trucks (see Fig. 1) that will carry five field boxes at a time. One factory, however, unloads the field boxes onto skids which hold 30 boxes, and then uses an electric lift truck to move them to the preparation department, as shown in Fig. 2. This truck thus does the work of six men with hand trucks.

From this point in the operations the methods vary with the kind of fruit and the particular factory canning it. Where peaches are being handled the simplest method is to place the pitting tables facing each other with a narrow aisle between their fronts and a wider aisle between the backs of each pair of tables. The inspectors use the narrow aisle while the checkers and truckers use the wide one (see headpiece). To the left of each pitter under the table is a slide, like a drawer slide, which will hold two boxes of fruit. When the pitter has emptied the box nearest to her, she places it on the floor and puts in its place the full one from the bottom. Into the empty place the checker places a full box and credits the pitter's rate card. With a long wire hook he pulls the empty box under the table to his side and places it on his truck.

The pitter separates the peach halves into sound, green, and pie fruit and places them in appropriate boxes and pans in front of her. When these have been inspected and any errors corrected, they are collected by truckers and taken to the elevating conveyor leading to the peeler, shown in Fig. 3. Other truckers remove the green, pie fruit, trimmings, and pits. It is evident from this description that a great many workers are employed in the preparation department, and that there must be more or less confusion, spilled fruit, and general "messiness."

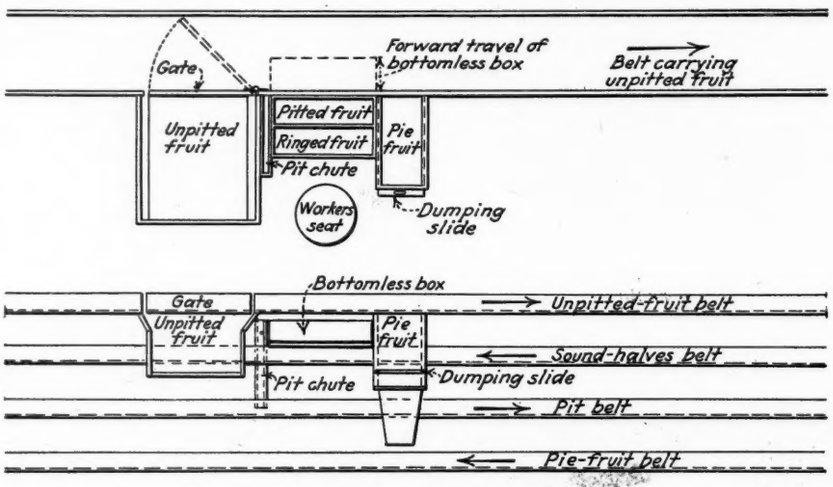


Fig. 7—The two-belt system illustrated in Fig. 4 is here shown in plan and elevation

THE simplest improvement on this system was found at the plant of the California Co-operative Producers, Oakland, Calif. The pitters sit at a wide, rubber-covered belt, instead of a table, with pans for the prepared fruit resting across the guide rails of the conveyor, as shown in Fig. 5. Six pairs of belts are used, with a narrow aisle 3 ft. wide between belts, and a wider one of 10 ft. or so between pairs.

This system accommodates 240 pitters in groups of 40. Four checkers keep the pitters supplied with fruit and take away empty boxes, trimmings, pits and green fruit, the last being the only sorting operation performed by the pitters in this plant. Two inspectors move up and down the aisle in each pair of belts, and after inspecting the pitted halves, empty the fruit into the belt immediately underneath. At the end of the line the pitting belt dumps onto another belt moving across the ends of the whole row of pitting belts, that gathers the fruit from all of them and carries it to the peeler. The preparation department of this plant is singularly free from confusion and is very clean and quiet.

The same set-up answers for apricots and pears. For the former a gate diverts the halves past the lye-peeler directly to the size-grader elevator, and for pears a second gate leads directly to the pear grader.

A more elaborate system, which eliminates all ex-

traneous help except the checker, is found in two other plants. Here two belts, one above the other, are used. Thirty-four pitters, seventeen on a side, face one another across the belts. When the pitter needs a box of peaches she opens the gate, marked with her number in large figures, as shown in Fig. 4; the checker at the charging end dumps a box of fruit into a hopper above the belt and credits the pitter's rate card which is in a rack in front of him. The peaches travel down the line until they reach the gate that shunts them into the pitter's box.

In front of each pitter, as shown in the headpiece, is a bottomless metal box divided longitudinally into halves and so arranged that when it is pushed forward the front half will be over the lower run of the top belt. Just to the left of this box and between it and the storage box of fruit is a narrow metal pit chute leading to the top run of the lower belt. To her right is another bottomless box with a slide underneath. When the slide is pulled out, this communicates with the lower run of the bottom belt. Fig. 7 illustrates the arrangement.

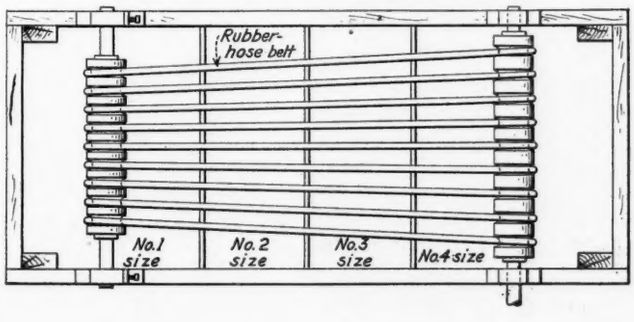
The pitter works with this system as follows: Taking a peach from the storage box at her left, she "rings" it—i.e., makes a cut clear around it at the suture—and places it in the nearest half of the box in front of her. When this is full, she pits the ringed fruit, drops the sound halves into the other half of the box and the pie fruit into the box at her right. The pits go into the chute at the left. When the work has been inspected the box in front is pushed forward and the slide under the pie fruit box pulled out.

The pits are carried to a conveyor at the end of the line and the sound and pie fruit to another. The pit conveyor leads to freight cars outside the factory and the fruit conveyor, with both pie and sound fruit on it, but separated by a central partition, goes to the elevator-belt leading to the lye peeler.

The three systems just described constitute the ones most generally used to prepare peaches for the lye peeler. Apricots are handled in much the same manner but, as they are not usually peeled, they go directly to the size grader from the preparation tables. With the first system the maximum number of laborers are required; with the second, one checker and one trucker for 60 pitters are necessary; while the third reduces the amount of labor to the minimum.

THE HANDLING of pears is modified by the fact that this fruit usually is peeled, cored and graded at the preparation tables. Most canneries receive orchard-run pears, delivering the boxes direct to the peelers, who peel, split, core, and separate the fruit into four sizes

Fig. 8—Ordinary rubber hose is used for belting in the pear grader shown here in plan. Moving from right to left on the diverging belts, the pears fall into the chutes underneath and are graded to an approximate size.



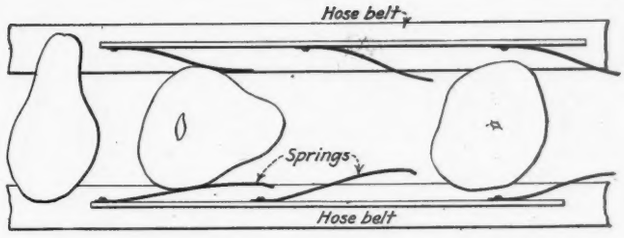


Fig. 9—Interesting gadgets, not shown in Fig. 8, are these spring clips that make the pears travel lengthwise of the belt.

of sound halves, green and pie fruit. It is then ready for canning. Each size is separately gathered up by truckers, who use a rack mounted on castors, for transporting the pears to the canning tables.

The peculiar shape of the pear seems to have discouraged the invention of machines for grading them to size. Although some such machines are in use, their adoption has not been universal. Those graders that are in use consist of six lines of rubber hose—ordinary garden hose—mounted on pulleys which are farther apart at one end than at the other, as shown in Fig. 8. Pears are fed onto the end where the hoses are closest together, and drop through the gradually diverging spaces between them as they travel along.

The use of a pear grading machine introduces some modification of the older methods of preparation. One factory takes orchard-run fruit, peels, stems, and cuts off the blossom ends, then conveys them to the grading machine by a belt. Next the separate grades are halved and cored and transported to the canning tables by another belt.

Another factory grades the fruit into four sizes before peeling and pays a slightly different rate for peeling each grade. At this plant, after peeling, the whole fruit is graded by machine a second time and then the graded fruit is conveyed by belt to a splitting machine. This machine must be fed by hand and requires two operators to keep it going to capacity. It consists of a heavy bronze wheel with a rim about 6 in. in thickness carrying sockets into which the pears are set, small end down. The wheel has a slot around the periphery passing through the middle of the sockets. As the wheel revolves a rotary knife in the slot cuts the pears in half, the halves falling out on the other side. It is asserted that by the use of this machine every pear is evenly halved and, after the coring operation which follows, there are fewer halves of irregular shape or in which the coring knife has cut completely through the flesh. After the coring operation and sorting out of the pie fruit the halves are carried directly to the canning tables by conveyor.

REVERTING again to operations on peaches which now have reached the lye peeler, the peeler and graders usually are located on a mezzanine or second floor of the factory with a bucket elevator to carry the peaches up to it. One large factory, with more floor space than usual, uses a belt conveyor rising on a long, gradual slope (see Fig. 3). Some plants use two peelers, one for sound fruit and the other for the pie grade, though this is not the general practice, since the sound halves must always be sorted after peeling. It will now be supposed that the peaches have passed peeler, washer, and blancher satisfactorily and are ready to go to the size grader. Most factories make a separation of pie fruit at this point and slicing fruit as well. One plant,

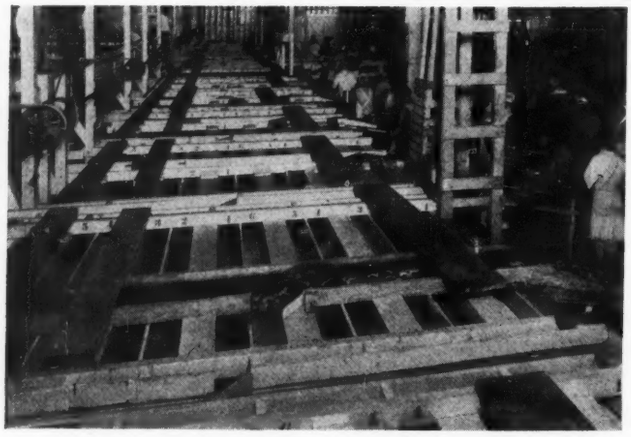


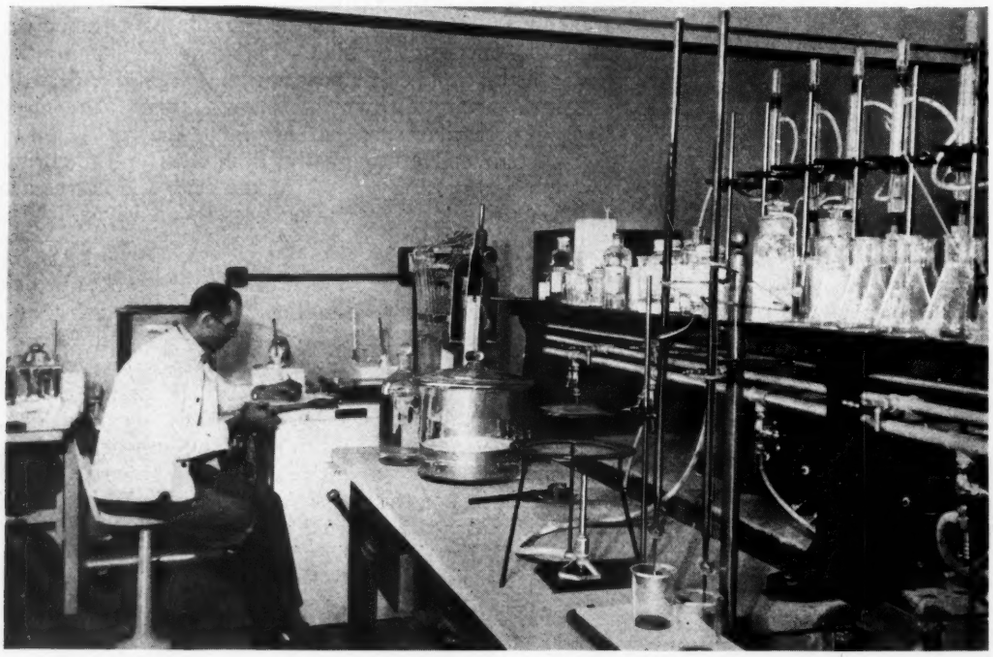
Fig. 10—Twelve-belt peach distributor at California Co-operative Producers' plant at Oakland.

however, first grades the fruit for size and then inspects each size, maintaining that the individual inspectors have less fruit to observe by this method and hence can do a better job, leaving less for the canners to pick out. Also it is stated that fewer inspectors are necessary, since some sizes will require but little sorting.

In any case the halves go next to the size grader, which may be either oscillatory or rotary. It delivers the accurately sized halves by appropriate chutes to the canning tables, slicing machine, or pie-fruit department. It is here that practically every factory uses some sort of belt-conveyor distributing system regardless of any shortcomings in this respect in other parts of the factory. This distributor may be simple or quite complex. Usually it consists of one or more wide rubber belts divided longitudinally by 6-inch wooden partitions so that the same belt carries four or five grades of fruit. Gates shunt the fruit off onto lateral belts leading to the canning tables. By pushing a gate across the lateral belts the canners divert the halves into their own canning sinks. One factory uses a system in which the belts carrying the different sizes are placed one above the other (seven belts are used) with gates diverting the fruit into chutes at the proper canning table. With this system it is possible to put any grade on any canning table in the house, simply by opening the proper gate into the chute.

The factory which grades the fruit after it is sized uses a wide belt with a narrow part partitioned off on the side farthest from the inspector, as shown in Fig. 6. Into this she places the pie fruit to be carried to a belt which receives this grade from all over the factory. In a chute just to her left she places the slicing fruit. This drops onto the lower run of the grading belt and is discharged into a belt leading to the slicing machines. Since each grade is sorted separately it is a simple matter to keep the sizes separate and divert them to the proper slicing machine for that size. After passing through the slicing machines the slices are inspected and pie grade dropped onto a belt leading to the pie belt, as earlier described.

The distributing system in this plant is the most complete of any observed. It consists of twelve belts moving in troughs; six in one direction and six in the opposite one, and is shown in Fig. 10. Chutes and gates divert the fruit into the lower runs of laterals leading to the canning tables. Fruit of improper grade is placed by the canners on the top run of the belt, which carries it back to the main system for redistribution. This method entirely eliminates the placing of improperly graded fruit into pans or boxes, by the canners, with the inevitable resultant muss and confusion of workers carrying it away from the tables. Working space is kept dry and the canning operation is speeded up considerably. This distributor system will place any grade of halves or slices on any designated table and will also take fruit from one table to another. Some of the main lines carry three grades of fruit in different parts. One man watches its operation and keeps the fruit moving properly. When the fruit reaches the canning tables the procedure varies. It is here that the fruit meets the empty cans. In the next installment of this article the methods of handling the cans will be discussed.



Dry Skim Milk Faces Rigid Tests

in the new laboratory of the American Dry Milk Institute, one corner of which is shown in the photograph. The laboratory, located at 160 North LaSalle Street, Chicago, Ill., was established to keep check on the standard grades recently set up for this product. It is available to both purchasers and manufacturers. Donald H. Magraw, in charge of the testing service, is shown jotting down a few results.

Packaging Materials

In the belief that the fast-growing practice of supplying foods in packaged form is of general interest to our readers, the editors offer herewith authoritative text contributions on the principal materials that are used for that purpose

What Cellophane Offers Foodstuffs

By L. B. STEELE
duPont Cellophane Company, Inc.,
New York City

ALTHOUGH transparent Cellophane has come into popularity as a packaging medium for a wide variety of products during the past five years, its basic characteristics fit it primarily as a wrapping material for foodstuffs. In fact, it was first introduced into this country from France as a wrap for candy.

While the qualities of the finished product are of outstanding interest to the food packer, the manufacture of Cellophane is interesting enough to merit a brief outline. The basic ingredient of the material is high-grade spruce pulp. This wood pulp is dissolved in a caustic solution, and carbon bisulphide added to disintegrate completely the pulpy fibers. The result of these and other important chemical operations is a viscous, amber-colored liquid.

This viscose is now forced under pressure through a narrow slit of metal into an acid bath which instantly solidifies it into a thin sheet. After a series of purifying and bleaching operations, the product is dried, coming off the final rolls in the well-known transparent, glistening form.

With the growth of the domestic Cellophane industry, practically all leading firms in the candy industry adopted the new material on their higher-priced box line, not only for the sake of sales appeal but because of the elimination of shopwear of the light, easily soiled boxes.

The use of Cellophane as a candy-box wrap suggested it as a direct wrap for bar goods. It was given a trial. Since "impulse sale" is such a factor in candy selling, and since the appeal of the candy itself is its own best salesman, the transparent type of wrap proved decidedly popular, and millions of bars are now sold in Cellophane.

It was only natural that other food producers should seek to capitalize on the successful experience of the candy trade, and in a short time a number of leading bakers began packaging their cookie units in this transparent wrap. The Cellophane-wrapped cookies became counter-display items and the attractive packaging served to draw the attention of customers and speed up impulse sales.

The dried-fruit industry next turned to Cellophane to provide a proper package for dates and figs. These fruits need to be openly displayed to permit their appetizing appearance to act as a sales aid, but at the same time their inherent stickiness must be protected from dust and dirt. Other dried fruits—prunes, apricots, raisins—also are being successfully packaged in Cellophane in substantial volume.

Prunes packed in Cellophane

Packers of berries, apples and citrus fruits have likewise been investigating the possibilities this transparent type of wrapper offers them as a means of increasing the sales appeal and display value of the choice section of their crop. The results seem distinctly encouraging.

Cellophane has also proved to be of service to the meat packers in the marketing of their unit-package line of products. Starting with sliced bacon, a few progressive packers pioneered the Cellophane-wrapped unit and found it very effective in increasing sales. The visible package acted as a suggestion to housewives doing their marketing, and they added bacon to their menus. As the trend toward units and packaged meats continued, the use of Cellophane spread from bacon to sausage, frankfurters, dried beef, picnic hams, shoulders and other items, including smoked meats. It provided the answer to requirements for an attractive, convenient, sanitary, identified package that could be displayed even on open stands.

Experience has indicated that meat buyers are quite evidently "eye" buyers and consequently the amount of meat being packaged in this visible type of package continues to increase.

From meat to fish is only a short step, and here too Cellophane plays a part in the packaging methods in vogue. Making its entrée on the rather commonplace looking smoked herring, it made possible a package that permitted trade mark identification and, being grease- and odor-proof, made display possible without danger of affecting other adjacent foodstuffs. Because of these advantages fish packers later adopted Cellophane for other types of fish.

Turning to macaroni and noodles, we find Cellophane providing an attractive package that wins counter display and suggests "noodles" to the customers in such an inviting manner that a substantial number of new noodle users are developed, with consequent increase in sales. The acute weather conditions in northern parts of the country created a few breakage troubles in the beginning, but this was soon remedied by use of a heavier grade of Cellophane.

In this rapid spread of usage on foodstuffs certain foods were found to require some unusual moisture protection not possessed by the regular grade of Cellophane. This included such items as cakes, nuts and some candies. After extensive experiments a special moisture-proof Cellophane was developed that has since demonstrated its value as a wrap for products that have a tendency to lose or take up moisture. Perhaps the outstanding use of this special grade is on cakes, where visi-

bility is so desirable in emphasizing the cake's appetite appeal, and exposure is so certain to cause drying out. Moisture-proof Cellophane has not only proved a means of increasing cake sales but has materially reduced "stale returns."

The cheese and butter makers also see opportunity for using moisture-proof Cellophane in certain types of their products and are conducting experiments to indicate in just what manner it will serve to best advantage. The honey packers have found it helpful in showing the combs while protecting the sticky honey from dust and germs.

In the tea and coffee field Cellophane has also come into use. As a wrap for tea balls it has furnished an attractive display package. On coffee it is used as a box wrap that gives attractiveness and moisture protection. As a direct wrap for the coffee itself initial experiments proved unfeasible, but the new double-wrap type of package seems to offer possibilities.

The recent trend toward quick-frozen foodstuffs that is occupying such a prominent place in food merchandising discussions at this time also has utilized Cellophane as a packaging material. On the frozen fish fillets its moisture-protective properties aided in keeping the fish in good condition and retarding the "defrosting." The new fresh meat cuts shown at the Meat Packers' Convention in Chicago also indicated its value as a means of attractive display. It has likewise been used on "frosted" strawberry units on the Pacific Coast.

Because these frozen foods need visibility to show their appetizing appearance to the best advantage and thus induce housewives to try them, Cellophane seems destined to play an important part in this development.

So we see that Cellophane, in serving this wide variety of food products, offers unusual advantages that prove of great assistance in stimulating sales in this era when "see what you buy" is the watchword of so many foodstuff buyers.

Increased Use of Visking

To the Editor of "Food Industries":

I have been giving some thought to your request for up-to-the-minute developments in the use of cellulose film tubing in the food industries.

There are several things being worked on, but most of them have not reached a stage sufficiently far advanced to warrant any publicity. You will readily understand that in many cases where a manufacturer is contemplating the use of our product, and is working with us on it, no publicity is desired until the problem reaches the point where it becomes practicable and consequently the user can make an announcement of something novel.

However, two recent developments have been placed before the public, a description of which follows:

A new development in the application of seamless cellulose tubing came recently in its use as a wrapper for candy. The Chase Candy Company, of St. Joseph, Mo., is responsible for a clever example of this application. The cellulose tubes are filled with a warm chocolate confection and, before the mass cools, "links" are made by twisting at short intervals and tying a cord around the twist. These "Fidos," as the divisions are called, are finding a wide welcome in the Middle West.

Another recent development consists of large cellulose casings for bologna, salami, and the like, on which the trademark of the packer is printed in bright colors. The printing is done by a specially developed process in order that the stuffed product may be passed through the smoke house and afterward cooked in water, without having the printing come off. When this new type of "distinctive" casing made its appearance it immediately became very popular, thousands of them now being used all over the country.

The demands upon us in recent months by the packing industries have kept us extremely busy in expanding our plant, and we are just now beginning to think again along the lines of other uses.

I hope that the information inclosed will be of some use to you and I am sorry that I am not able to give you considerably more at this time.

Thanking you for your request, I am

Yours very truly,

W. F. Henderson,
Chief Chemist,
Chicago, Ill. *The Visking Corporation.*

Glassine and Wax Papers

By H. A. Stone
Warren Manufacturing Company
New York City

As there are several types of wrapping paper which are at times all called "wax paper," it is advisable to make a few definitions to show exactly what is meant by such terms as glassine, wet wax and dry wax.

Glassine paper is not wax paper at all. There is no wax about it. In the process of manufacture, new spruce pulp is beaten much longer than if it were to be used for ordinary paper, and the fibers become hydrated. In other words, water has been mechanically forced into the shortened cellulose fibers, making their texture gelatinous. This hydrated pulp when made into paper is known as *greaseproof,* and it is just that. As oil and water don't mix, obviously oil or grease cannot penetrate paper already containing water. To make greaseproof into glassine, the paper is polished in supercalenders, sealing in the water and giving the high transparency of real glassine paper.

Wax paper is made by applying melted wax to paper. The wax should be odorless, colorless and of high melting point. The advantages of purity and freedom from odor are apparent if tainted food is to be avoided. In warm weather or a heated storage space a low melting point wax is liable to melt off and injure the food in contact with the wrapper. From the angle of the baker or packer also a high melting point is desirable, as it prevents stored paper from sticking together and becoming unusable.

Wet wax means that most of the wax is left on the surface of the paper. It is the commonest type and the most effective. However, it is not adaptable to all purposes.

Dry wax paper has the wax driven into the sheet by pressing between rollers. The paper does not hold as much wax as when wet waxed, but in hot climates and in certain special instances the dry wax paper is more satisfactory.

Self-sealing means that enough wax is on the surface of the paper to seal the wrapper when heat and slight pressure are applied.

Waxed glassine combines the good features of glassine and wax paper. It is wet waxed, as the wax cannot penetrate the polished surface or saturate the hydrated fibers. The paper being already of high transparency, when waxed it is the most transparent wrapping paper obtainable. Furthermore, when waxed the greaseproof and moisture-proof properties of glassine are augmented to an extent that produces an absolutely waterproof wrapping paper.

Paper for waxing should, in general, be full bleached and strong. A paper free from pin-holes and imperfections also is needed, for wax cannot be expected to fill more than the normal interstices between the fibers. Outside of the familiar amber used by certain large bakeries, colored papers are not in demand.

Printing is done before waxing. Four-color work is practical and the possibilities of good art work and attractive labels have not been developed very far.

While most tests of the qualities of wax papers have been made by the manufacturers, they have been conducted fairly and intelligently, and some of the results obtained are shown in the table below.

The table records the data derived

from a test to determine the moisture resistance of waxed glassine and wax paper used as a wrapping for corn flakes. Three packages were used: the first, simply the ordinary paper carton; the second, the paper carton with an inner wrapper of 33-pound waxed sulphite paper; and the third, the paper carton with an inner wrapper of 29-pound waxed glassine. The corn flakes were dried in an oven at 212° F. for twenty minutes. All weights are in grams and include carton plus cereal. Per cents of weight changes are based on original weights. The accompanying graph illustrates the percentage of variation in moisture absorption in the test packages.

The results of these tests on cornflakes are typical of many others to determine the effectiveness of waxed glassine, and invariably this type of wrapper displays its superiority as a moisture resistant in comparison with other types of wrapper, in about the same ratio. The results are also consistent with those obtained by consumers of waxed glassine who are already using this wrapper in the packaging of their products.

A recent test of loss of water from marshmallows in different wrappings showed equally striking results. In this test, cartons of marshmallows were wrapped as follows: No. 1 carton—unwrapped; No. 2 carton—wrapped in one sheet of 30-pound self-sealing wax paper; No. 3 carton—wrapped in two sheets of 30-pound self-sealing wax paper with seams on opposite sides.

In a week's time the losses in weight caused by drying out were 7 per cent in No. 1, about 1¼ per cent in No. 2, and about 0.5 per cent in No. 3. During the ensuing seven weeks of the test, package No. 1 lost weight fairly constantly up to about 10 per cent at the eighth week. Apparently most of the drying out in this unwrapped carton occurred immediately and further drying could not proceed rapidly, as there was relatively so little moisture left in the marshmallows.

Package No. 2, with the single wrapper, and package No. 3 with the double wrapper continued to lose weight at approximately their initial rates, showing respectively 7 per cent and 3 per cent losses at the end of the eighth week.

This test makes it apparent that while one good waxed wrapper is a splendid protection, a double wrapper with the seal on opposite sides will keep foods fresh twice as long.

A wax wrapper for citrus fruits has given ample proof of its value. Oranges and lemons when newly packed bulge the top and sides of the crates. If the fruit is wrapped in ordinary tissue, most of the bulge is gone inside a week or two. The loss is in juice, flavor and the aromatic oils of the skin. Experiments in packing and shipping conclusively demonstrated that if a wrapper of self sealing wax paper of 25-pound basis or heavier were used, the loss in juice and flavor was negligible, even over a ten-week storage period in the warm climate in which the fruit was grown.

The chief objection to the use of wax-paper wrappers for citrus fruits was the fact that girls in the packing houses could not wrap the fruit with them as quickly as with the light tissue. Also, the additional bulk of the paper slightly decreased the number of fruit per crate. These objections are gradually being met and overcome.

A trial of coating the fruit with wax was made, but proved impractical. While there was no loss of water, the sealing of the pores in the skins stopped normal respiration and fermentation spoiled the fruit.

A test of several types of packing for print butter showed superior quality in butter packed in vegetable parchment, wrapped in wax paper and inclosed in a waxed carton. The butter was kept in cold storage 155 days, demonstrating that wax-paper wrappers can be profitably used to supplement cold-storage preservation.

The heat-insulating properties of a waxed glassine wrapper were clearly demonstrated in a test made in the laboratory of a Long Island City ice cream manufacturer. Two cartons of brick ice cream were taken from the storage room. One was wrapped in 29-pound glassine and sealed with a hot iron, while the other carton was not wrapped. After recooling to —12° F., the two bricks were let stand for 45 minutes in a temperature of 80° F. Upon inspection, the unwrapped carton was found to contain soft, mushy ice cream, while the wrapped carton contained a firm and solid brick with only traces of melting at the corners.

Wax paper has not been found adaptable for use next to chocolates, but plain glassine serves admirably for bonbon cups and the like. The smooth surface prevents sticking and is relatively moisture-proof and quite greaseproof.

Tests of Waxed Paper

Date	Weight	Package Unwrapped Per Cent Change	Package Wrapped in 33-lb. Waxed Sulphite Weight	Per Cent Change	Package Wrapped in 29-lb. Waxed Glassine Weight	Per Cent Change	Relative Humidity Per Cent
Aug. 3	296.5	.....	306.0	....	314.7	...	33
4	304.7	2.76	307.5	.49	314.7	.00	33
5	308.5	4.05	308.9	.95	314.9	.06	44
7	318.4	7.39	312.8	2.22	315.7	.32	68
8	327.7	10.52	315.7	3.17	315.7	.32	72
9	332.4	12.11	316.3	3.37	315.7	.32	57
10	318.5	7.42	314.1	2.65	315.4	.22	42
11	321.6	8.97	315.2	3.01	316.1	.45	36
12	321.2	8.33	316.0	3.27	315.7	.32	40
13	327.0	10.27	319.0	4.25	316.2	.48	52

Another wrapping job not lending itself to the use of wax paper is the packing of seeded raisins. They are packed at about 200° F., a temperature which would melt the wax. Here again glassine is suitable.

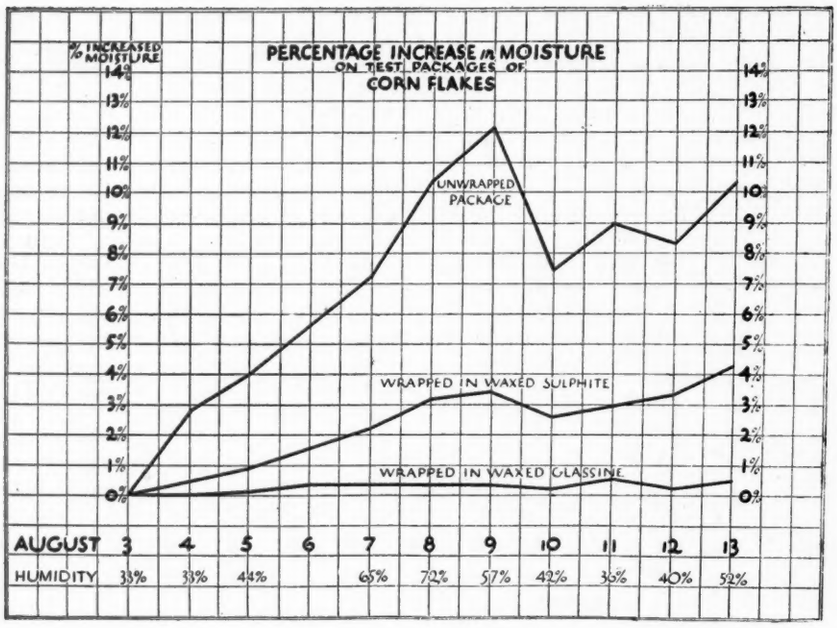
Glassine has many uses due to its excellent transparency, which is greater than any wax paper excepting waxed glassine. Everyone is familiar with it on packages of cigarettes and candy. One of its advantages is the fact that it can be glued, as wax paper cannot, giving it a very wide use in bags and articles requiring a strong seam. Glassine, being greaseproof, is of especial value where the product wrapped is oily. Buttered popcorn, salted nuts and many foods of similar nature are effectively packaged in clear glassine bags. Since aroma usually is contained in an essential oil, flavor also is retained.

Plain glassine may be embossed in attractive patterns for increased selling appeal. There are degrees of transparency in glassine, a full bleached, highly transparent sheet, of course, making the most desirable package.

As the primary object of packaging is to insure the arrival of a food product in the hands of the consumer in its original fresh condition, the wrapper should be waterproof, greaseproof and dustproof. Transparency as an aid to display also is an undoubted selling factor. Consideration of all these qualities has led many bakers to the use of waxed glassine. It is sparklingly transparent. The glassine, being greaseproof, keeps the shortening and flavors in, also protecting the contents from outside odors possibly encountered in delivery or in stores. Ordinary wax paper is practically waterproof, but waxed glassine is absolutely so. (A possible explanation of this difference lies in the probability that while the wax fills the interstices between fibers it does not seal the ends of the long unhydrated fibers. These then by capillary action allow the passage of water through the sheet. Short hydrated fibers in super-calendered glassine are completely covered by the wax and the sheet is then perfectly impervious to water, even after continued soaking.)

Self-sealing waxed glassine wrappers defer the time when cakes become stale from the second day to the seventh or eighth. Naturally this saving in stale cake means that practically all cake delivered is sold, far more than compensating for the slight added cost of the wrapper. The self-sealing feature of wax paper and waxed glassine means a hermetically sealed package, something not possible with other materials depending on a fold or spot of glue to close the wrapper.

The use of glassine, wax paper and waxed glassine in the home is increasing very slowly when one considers its myriad uses. That it may be used for wrapping lunches everyone knows.


% INCREASED MOISTURE
PERCENTAGE INCREASE in MOISTURE
ON TEST PACKAGES OF
CORN FLAKES
UNWRAPPED PACKAGE
WRAPPED IN WAXED SULPHITE
WRAPPED IN WAXED GLASSINE
AUGUST 3 4 5 6 7 8 9 10 11 12 13
HUMIDITY 33% 33% 44% 65% 72% 57% 42% 36% 40% 52%

That a sheet of waxed glassine wrapped around a cut melon, celery, cheese, butter or used as dish and jar covers, will keep the refrigerator free from odors and preserve food longer is not so well known and less generally practiced. Other uses in the home would include the rewrapping of practically all products delivered in a waxed wrapper which is torn or destroyed in opening the package. A self-sealing bread wrapper cannot be put together again to properly protect the bread, nor can the lining of a package of breakfast cereal. Wax paper or waxed glassine bags would be useful household articles in this connection, especially for sliced bread.

Paper Cups

By L. V. KEEFE

Lily-Tulip Cup Corporation, New York City

WHEN the distribution of food products in packages began to meet with the approval of manufacturers, the makers of packaging materials immediately began to reach out for the most adaptable material for the construction of containers. They were quick to recognize that any such material must be capable of direct imprinting, or so constructed as to carry a label, to the end that the maximum display and advertising value might be provided. In the beginning, as is the case today, practically all containers were made of glass, metal, wood, or paper. Each had its particular appeal and was taken up in one form or another by the distributors of various products. We shall deal here principally with the evolution of the paper container and the progressive measures adopted by those engaged in the paper industry to keep pace with the advancement of merchandising methods and perfect new types suitable for an ever-widening range of packaged food items.

The early cartons were either square or rectangular and made from cardboard. The printing was crude and the construction of these cartons made them suitable for a very limited number of dry commodities — cereals, powders and the like.

These paper cartons had advantages which appealed to the manufacturer, and the paper industry was quick to realize the advantage it held in the package field. Paper packages were light, thus reducing the cost of shipping and handling; they could be more easily and attractively imprinted, and they eliminated the costs incident to the handling of individual labels. The space required for most of them was far less than that generally necessary to carry a warehouse stock of packages of other materials. There was less waste through breakage and jamming and, far more important still, these packages could be purchased at a considerable saving. Knowing all these things, progressive paper mills began immediate experiments to eliminate the weaknesses which prevented a wider use of paper packages.

As a result of those experiments, the number of products packed in paper cartons has increased with leaps and bounds, and the paper industry is still working to extend the use of its products.

One of the very important developments in the advancement of paper packages was the perfection of one which would be liquid-tight. The first acceptable container of this type was a cylindrical can. This was originally designed to meet the demand of brewers and saloon keepers who were forced by state and municipal legislation to provide a send-out container for beer that eliminated the time-honored custom of carrying home this almost-forgotten beverage in a tin bucket.

As a natural development, a need for attractive paper packages, with greater sales appeal, wider variety of shapes and sizes, and so constructed as to render them suitable for distributing moist, semi-moist, and dry food products was soon felt. People looked askance at this development because of the apparently fragile nature of paper, and the myth of its so-called "taste." To meet this pressing demand "Nestrite" containers were born.

The first thing which had to be done in the development of this package was to eliminate any paper "taste" or "odor" and remove the ancient prejudice which had so far prevented a wider use of paper containers. Extensive experiments showed that the most acceptable paper stock was pure bleached sulphite, the manufacture of which requires a simple but thorough process which effectively destroys all foreign substances such as pitch, resin and tar, and produces an absolutely tasteless sheet.

After a suitable paper stock had been decided upon and samples prepared for test it was found that the use of animal glue was neither practical nor desirable. The body of the container is a series of laminated layers so closely adhering as to give the appearance of a solid wall. The proper handling of the laminating procedure was dependent upon the use of a suitable adhesive. The subjection of animal glue to heat and moisture produced an objectionable odor and taste, and it was necessary, therefore, to find a substitute which would have all the advantages of glue without any of its disadvantages. As a result of further experiments, an adhesive composed of vegetable compounds, tasteless and odorless, was perfected. That it is proving thoroughly acceptable is evidenced by the great number of these containers now used by manufacturers in many branches of the food industry.

In the beginning, this type of container was placed on the market without the application of any other processing of the paper. It was thoroughly satisfactory for the distribution of ice cream, as a send-out package for hot and cold drinks at the soda fountain, and the packaging of some dry food products. But it was apparent that some treating process was necessary to widen the range of products which could be successfully packed. Tests showed that pure

Sealed and unsealed paper cups

paraffin, tasteless and odorless, could be applied without in any way injuring the original product or destroying its appearance or structure. The waxed container then was placed on the market, and it is this package which has appealed so strongly to food manufacturers. Incidentally, paraffin has played a very important part in the development of paper packages of all shapes, sizes and material. Many cartons are treated directly while others are wrapped in paraffined paper, both to increase the attractiveness of the package and to protect the contents for a longer period.

The waxing of the container adds greater strength and considerably increases its attractiveness by giving it a brilliant finish. Another advantage of this type package is that it can be sealed with a machine which is furnished at a nominal cost and turns out a rolled "seal" which practically excludes air.

There has been a steady increase in the number of products packed in this container and today these include such items as coffee, lard, sausage, tea, cottage cheese, ice cream, frozen fruit, gelatine, jelly, sandwich spread, mayonnaise, mincemeat, chili, oysters, honey, candy, peanuts, popcorn, and a variety of others. Just recently a progressive organization in the East adopted it for the distribution of a fertilized dirt to be used in transplanting bulbs, ferns and small plants.

Paper containers are not suited to packaging every product as yet. For instance, they have not invaded the field occupied by fatty, oily, or greasy food products, or those having a high acid content, or those that are liable to fermentation subsequent to packaging. With research work constantly being done in experimental laboratories and the ability to make paper from so many different types of raw material, it is believed that a steadily increasing number of products will be marketed in this type of package.

Genuine Vegetable Parchment

By G. F. Des Autels

Research Department,
Kalamazoo Vegetable Parchment Company

IN RECENT YEARS it has almost come to be expected that any discussion of modern methods of packaging foodstuffs shall begin by recalling the open cracker barrel that stood near the stove, the churning of butter in the home, and a host of other things that have followed the horse into near oblivion. Nevertheless, no one can question the fact that vast changes have occurred, and that with them has come the need for packaging materials with new and special characteristics.

Many foodstuffs requiring packaging materials possessing such special characteristics are now satisfactorily wrapped in vegetable parchment, because of one or another of the unique qualities of this material. Among such foodstuffs, butter is an outstanding example. When every home was its own creamery, there was no butter-packaging problem. Today, such packaging is of tremendous importance.

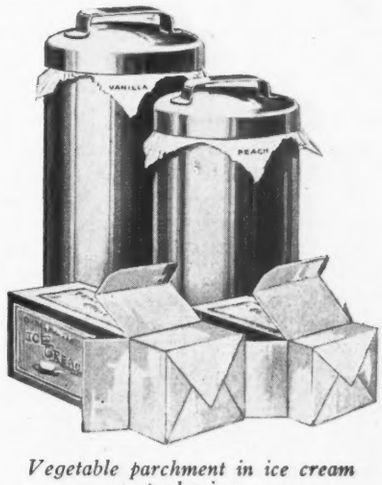
A sensitive product such as butter requires a pure wrapper, free from all taste, odor, coloring, or other foreign matter. It must retain its strength when wet by the moisture in the butter, and be impermeable by the butter fat. The ideal wrapper should also be fairly airproof.

Genuine vegetable parchment meets all of these requirements. It is stronger wet than dry; it is fatproof and oilproof, wet or dry; it contains no sizing, loading, artificial coloring, or other foreign matter, and it has no taste or odor. While not particularly airproof when dry, it gains in this respect when wet.

Parchment is used in every type of butter package—for prints, either with or without cartons; for various size rolls; in the shape of a circle on the top of butter in jars; for lining hermetically sealed tins for long keeping, and for the inside of butter tubs and boxes.

The same qualities which make parchment suitable for butter fit it for oleomargarin and lard. In a recent development in the latter field, warm liquid lard is poured into cartons lined with a special grade of parchment. This grade will stand folding and creasing without breaking or losing its greaseproof quality.

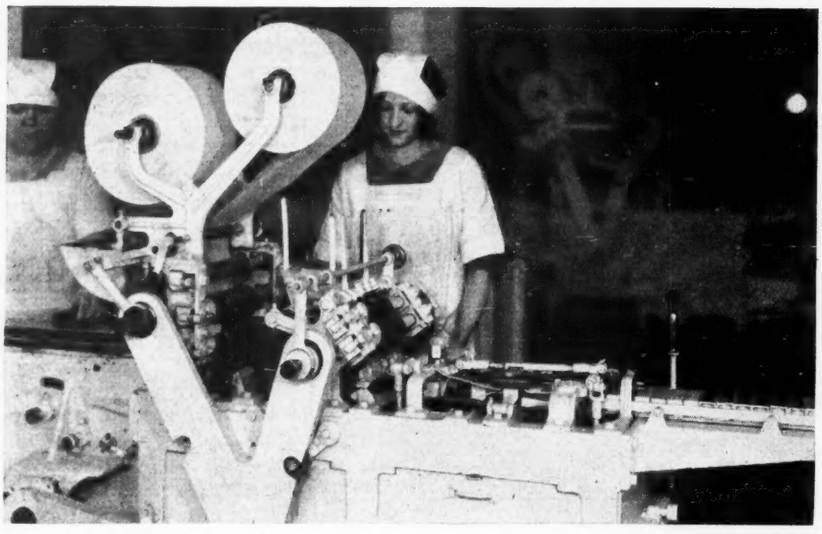
In the field of meats, too, the resistance of parchment to grease and moisture, and the desirability of a white wrapper which may be printed in striking colors, makes parchment valuable. In packaging individual cuts of frozen meat, waxed parchment has been found to give excellent results. The waxing, by making the package airproof, adds to its insulating value. When the meat



Vegetable parchment in ice cream packaging

is allowed to thaw, the resistance to moisture proves valuable. Fish fillets, when wrapped in parchment, also make use of its high wet strength.

When we come to liquid products, we find that this wrapping material has further uses. Gaskets of parchment are used to seal milk-can tops; in fact, they are required by law in certain states. In



Wrapping butter in vegetable parchment

addition to sealing the cans against the entrance of dirt, they offer protection against metallic contamination due to worn or rusty can-top collars.

The use of vegetable parchment on fresh leafy vegetables such as celery and lettuce, both to wrap individual bunches and to line shipping cases, has proved beneficial. A prominent Eastern market gardener reports that he has realized an average of 25 cents per box more for head lettuce wrapped in parchment than it would otherwise have brought. Parchment is especially valuable when such products are to be packed in crates containing cracked ice—due again to its wet strength.

Tests have shown that in coffee packages lined with parchment, contamination of this highly sensitive product is prevented. A discovery that the "fluff" of tea does not stick to parchment has made it desirable for lining in cartons in which tea is to be packed.

A final use for vegetable parchment is as a liner for canned goods. Canned chicken, lobster, shrimp, fish flakes, and other sea foods may be so packed. For most of the sea foods which, together with some other products, are subject to sulphide blackening, a special grade of can-liner parchment has been developed which largely prevents any black discoloration.

No discussion of the uses of vegetable parchment in the packaging of foodstuffs would be at all complete without reference to printed parchment. A great deal of the parchment used in wrapping butter, meats and other products is now printed in a great variety of colors with inks that will not bleed, fade or discolor under any conditions, even, as in the case of butter wrappers, such severe tests as boiling in brine.

New Developments in Folding Boxes

By J. D. MALCOLMSON
Robert Gair Company
New York City

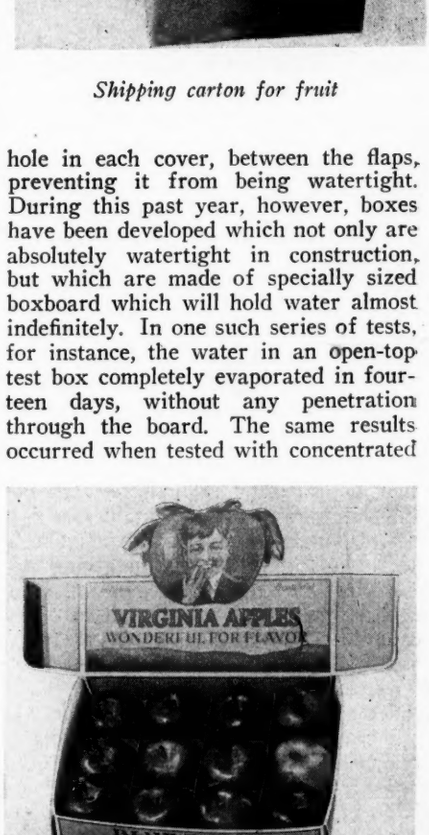
THE YEAR 1929 has witnessed what probably is the greatest single advance in the art of folding box design for food products of any one year. In addition, researches on the same subject have been instituted during this period, the results of which will continue this advance in knowledge at an accelerated rate during the coming months.

This comparatively sudden spurt is due partly to efforts on the part of box makers to get out of the ruts of competitive strife and partly to the demand by food manufacturers for economical boxes possessing specific properties which would have been characterized as impossible only a few months ago. In common with all American manufacture, the folding box industry is being called upon almost daily to produce these seeming "impossibilities." It is not only giving satisfactory results but is doing so at exceedingly low cost levels.

Many of these surprising developments are still more or less closely guarded secrets, but without going into details, it is possible to touch upon enough of them to demonstrate the wide scope of the movement. The food industry has concentrated this demand along two main channels: first, the requirement for boxboards of unusual resistance to moisture, grease, heat transference, etc.; and, second, for new and novel designs of box construction which have forced the best minds in the box designing field to throw overboard their previous ideas of the limitations of their profession. Thus it has become almost an axiom that the usual type of seal-end box had to put up with a minute

Shipping carton for fruit

hole in each cover, between the flaps, preventing it from being watertight. During this past year, however, boxes have been developed which not only are absolutely watertight in construction, but which are made of specially sized boxboard which will hold water almost indefinitely. In one such series of tests, for instance, the water in an open-top test box completely evaporated in fourteen days, without any penetration through the board. The same results occurred when tested with concentrated



Display cartons for apples

brine solutions and concentrated sugar solutions.

As may have been guessed from these paragraphs, many of these striking developments were made at the instigation of the quick freezing industry. This young giant of the food industry has not yet made himself known to the public at large, but box makers for months have been working at top speed to satisfy his endless and insistent demand for

containers—a demand that will not take "no" for an answer.

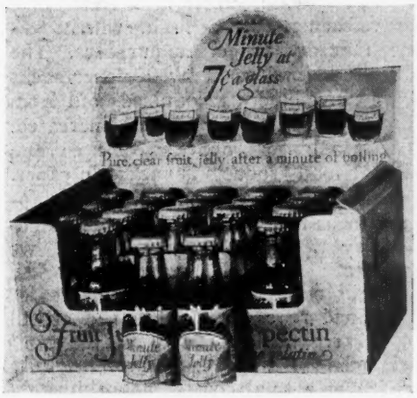
One of these paradoxical demands is for a board having a very high heat conductivity to speed up the quick freezing process as the package passes between the belts of the chilling machine. At the same time there is required an outer container of extra low heat conductivity to insulate the contents and maintain the low temperature. The solution of both these problems is in sight, especially by the use of corrugated board in the outer package. This material, because of its trapped cells of dead air, appear to be, for its cost, one of the most efficient insulators known. Curiously enough, this property was not thought of by its original inventors.

The rapidly increasing use of solidified carbon dioxide as a refrigerant has created an important field for paper boxes. Paper, or boxboard, is well known to be a first-class insulating medium, and this property can be greatly augmented by the design of the package and its interior parts. Already we are seeing ice cream put up in folding boxes containing a small piece of carbon dioxide ice, so arranged that the cream will keep hard for several hours without other refrigeration, and before long doubtless it will be common to see ice cream being delivered from grocery and chain stores right along with the regular order. Similarly, fresh frozen fish is being shipped hundreds of miles to interior points in folding boxes. During 1928 the production of packaged fresh and frozen fish increased 350 per cent over 1927, with the business still showing accelerated growth.

More recently, the meat packers have started the packaging of individual pork chops, steaks, lamb chops and other selected cuts. These are frozen by the sharp process and put up in attractive folding boxes which will assure the purchaser of uniform weight and quality, in place of the present uncertain results from the average butcher shop.

Some idea of the importance of the quick freezing development is given by the recent statement that one of these plants, not very large in size but having valuable patents, was purchased for $22,000,000 by one of the largest food companies. Work has already been started on the sharp freezing of over fifty food products, ranging all the way from fruit juices to berries and vegetables which will be marketed out of season. The importance of the proper folding box in such instances is paramount, both for proper maintenance of the product and for economy.

Another interesting patent now being exploited calls for the packaging of various food products in hermetically sealed folding boxes which are subsequently exhausted of air in a vacuum, and this air immediately replaced with an inert gas. It is claimed that as a result the contents will keep fresh and unchanged over long periods of time.



Attractive display carton for fruit juice bottles

The paper milk bottle is another recent development which has already been widely advertised. Its rapid adoption by some of the larger milk companies promises to show some surprising strides in the not distant future.

Among other unusual developments in the packaging of food products may be mentioned the incasing in folding boxes of such startling departures as ice cubes, sliced bread, etc. It is probably too early as yet to say just what is the future of such revolutionary ideas.

In the field of the more usual marketing of food products also the year 1929 has witnessed many important advances. Apples in folding boxes and corrugated containers have long since passed the experimental stage. Peaches, potatoes, berries and other fresh farm products are being so packed, often without refrigeration.

A more prosaic though no less important development is along the lines of standardization of sizes. Thus there are almost as many one-pound coffee-carton sizes as there are brands. Recently, the National Association of Coffee Roasters, in co-operation with the Paperboard Industries Association and the U. S. Bureau of Simplified Practice, have started an investigation with the object of reducing these to probably two final sizes. The same movement is under way with the ice cream manufacturers' association in an effort to reduce brick ice cream cartons to not over two standard sizes and probably a single shape. These efforts are in line with modern practice and will be of great benefit to all concerned.

It has been said that American industry has made greater strides in the last six years than in any previous quarter century and that today no manufacturer dares to rest on his oars because of the sudden and revolutionary improvements constantly taking place. Perhaps these sketchy instances will show that the paperboard container industry is in step with this movement. In fact, there are times when its research departments must attempt to forecast developments the success of which will often depend on the finding of suitable containers.

Corrugated Cartons

By H. H. Squire
Hinde & Dauch Paper Company, Sandusky, Ohio

THERE is an old familiar adage which asserts that "You can't keep a good man down." This ancient truism might properly be paraphrased and broadened to include products as well as persons, for just as the thought matters even more than the thinker, so it is the product, and not the producer, that lives on and serves.

Back in 1871 there lived a man named A. L. Jones. He was one of the good men who couldn't be kept down. He invented and patented a product which he called "corrugated paper," and today a great industry serves millions with the product first conceived by him.

You can't keep a good product down either. In the earlier days of its progressive introduction, the corrugated-fiber shipping box, with its stiffening sheet of the Jones corrugated paper, met and conquered both skepticism and open antagonism, its final and enthusiastic welcome being reserved for unmistakable demonstration of its efficiency.

In the food industries, its entry was by way of the glass container trade. Among the first to take advantage of the economy and other benefits of the corrugated package were the producers of glass fruit jars. From this beginning the transition to other glass containers was comparatively easy, and manufacturers of food products who received their jars and bottles in corrugated boxes soon followed in its use.

From this point, however, progress among the food-producing industries was comparatively slow. It required a world war, with its attendant shortage of lumber and timber, to launch the fiber box as a suitable carrier of foods put up in tin, in which field it has now been the leader for several years. Given a fair trial, the fiber package has continually made good.

The advent of quick-freezing and dry ice has opened up another field for the corrugated box whose insulating qualities specially adapt it to the carriage of frozen products. Already it has been tried and adopted by the leading pioneers in the frozen-food trades. Its fitness for such service is pre-eminent and its increasing use throughout the entire food industry is assured.

Paper Sacks

By K. L. Allen
Vice-President, Adams Bag Company, Chagrin Falls, Ohio

THE WIDESPREAD USE of rope-stock paper bags for flour and other food products is a direct result of three inherent qualities—cleanliness, strength and economy.

They are clean because the paper it-

self, as well as the paste used in the seams, is cooked under steam pressure during manufacture, giving a thoroughly sterile product.

They are strong because the paper is made from manila rope and jute fibers, and because the manufacture is carefully regulated to accentuate the natural strength of these fibers.

They are economical because they cost the flour miller or other food manufacturer far less per pound of product packed than any other known type of shipping container.

Added to these qualities, there is another feature which should not be underestimated in the colorful times in which we now live—that is the beauty of the finished package. Both the grocers' shelves and the home kitchen are brightened by the presence of a gleaming white sack, brightly printed.

Paper shipping sacks came into use in a rather substantial way about the time of the Civil War, and performed their economic function at that time by releasing cotton cloth, which was much needed for other purposes. The cleanliness and economy of paper sacks were immediately recognized, and from that day to this their use has increased. Today a large proportion of flour and similar food products is packed in paper.

Analyzing the economy of paper shipping sacks for flour and other food products by taking a typical example, we find that a barrel of flour may be packed in eight one-eighth barrel white-coated blue-lined rope paper sacks (an eighth of a barrel sack of flour being a typical and popular package for the family trade) at a total cost of approximately 25c. for the eight one-eighth barrel sacks printed and delivered at the flour mill.* Out of the total of $1.19, therefore, which is today's retail price for one-eighth barrel of good flour, the cost of the sack is only about 3c. Surely this is economy brought to a high degree.

*In 25,000 lots.

The Cotton Bag

By J. S. GRAHAM
The Cotton-Textile Institute, Inc.

USE OF COTTON BAGS in the distribution and sale of food products represents one of the established and important markets for cotton cloth. It is a market that has a twofold importance on account of its present size and the potential development anticipated in line with current merchandising trends in the food industry.

It is estimated that the present practice of packaging staple food products —such as flour, sugar, salt, vegetables, and smoked meats—calls for the consumption of more than 100,000,000 pounds of raw cotton annually for the woven fabrics from which these sacks and containers are made. The wholesale grocery trade alone consumes more cotton bags each year than any other single group using fabric containers for its products.

In the course of its studies of the important uses of cotton, the Department of Agriculture has made an extensive survey of the wholesale grocery trade. A preliminary report compiled by the division of cotton marketing of the department contains some of the most conclusive evidence as to the present large use of cotton bags in this particular branch of the food industry. For example, reports received from grocers in 38 states concerning 23 commodities of major importance showed that nearly 50 per cent of these commodities, by weight, were packaged in cotton bags. Included among the selected commodities were flour, sugar, corn meal, salt, coffee, potatoes, beans, peas, grain, rice, cereals, cottonseed meal, onions, starch, grits, hominy, peanuts, dried apples, and buckwheat.

Further analysis of replies received during this study reveals that four-fifths of all cotton bags reported were used in packaging flour and sugar. Salt accounted for 10 per cent of the cotton bags used. The relative importance of cotton sacks for these and other commodities studied is also indicated by the following summary, showing the percentage of those predominantly packaged in cotton in the wholesale grocery trade:

Sugar	90.69	Grits and hominy	38.43
Flour	89.10	Buckwheat	29.25
Corn Meal	80.39	Coffee	17.89
Salt	70.77	Beans and peas	15.06

These data, it should be understood, do not cover other methods of distributing such foodstuffs, but they may be considered indicative of the widespread use of cotton containers for these products. At the present time extensive market research is being conducted by various agencies, including the Cotton-Textile Institute, looking to a still larger use of cotton for packaging fruits, vegetables and other food products for retail distribution. Another important factor contributing to an increased demand for cotton sacks has been the progress which the food industry has made in its standardization of merchandising methods.

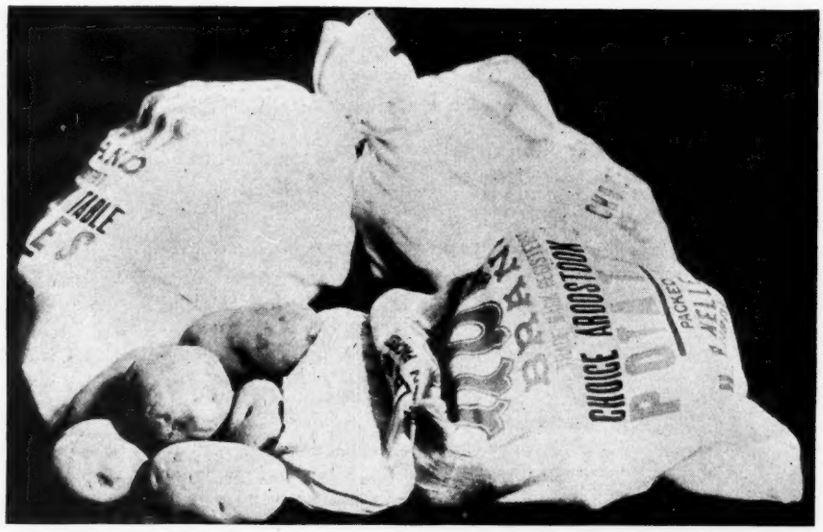
The advantages of cotton as containers for food products includes the following important features:

1. More attractive package.
2. Greater visibility of distinctive markings.
3. Strength with light weight.
4. Durability.
5. Greater re-use value.

In addition to these important qualifications cotton has another advantage that cannot be too strongly emphasized: cotton fabrics are inherently clean. They are made from a vegetable fiber that possesses this quality to a unique degree. This quality of cleanliness is of particular importance in fabrics used in any way for the shipment or handling of food products and it constitutes a psychological asset that must be readily apparent when the subject of packaging is considered from the standpoint of actual and potential consumer interest.

Careful study of the consumer viewpoint has also shown that many women prefer to buy staple foodstuffs such as flour, sugar and potatoes in cotton bags because when the bags have served their original purpose they are extremely useful for making convenient articles in the home. These bags can be easily handled in the kitchen, and when empty are often ripped open, washed and used again for a variety of purposes. Stamped

Choice potatoes are packed in cotton bags



designs on cotton bags are made up in a way that has no deleterious effect on the contents of the bag and may be easily removed by washing when desired.

Where fabric containers are specially made to permit a sampler or tryer—as is common practice in the case of rice—it has been found that the mesh in cotton bags would not resume its original protection after such an operation as other materials. Steps have been taken to alter the construction of fabrics, used for such commodities and it is felt that the practical requirements of the trade can be freely met.

Some object to the use of cotton bags on the ground that they may be easily soiled. Such a criticism is offset by the fact that cotton is essentially much cleaner as a container. In some cases it has been possible to use colored cottons—in gingham or similar construction—to overcome any such difficulty as well as to make a more novel and attractive package.

In view of the opportunities to extend the use of cotton bags in the food industry—and among other industries—the cotton textile industry has taken aggressive steps to develop this important market. The Cotton-Textile Institute is one agency which is now carrying forward studies designed to promote greater use of cotton for containers for vegetables and citrus fruits in retail packages. During the past year special efforts were directed to the use of 15-pound bags for potatoes. Potato shippers in Idaho have been so successful in building up a demand for their products in 25-pound bags that this new practice was introduced to important shippers in the Aroostook country section of Maine. Here, shipments made in 15-pound bags to several important Eastern markets, including Boston and New York, and the interest already shown indicate that this method has found favor not only with shippers but also with wholesale and retail distributors and consumers.

Two important features—in addition to the general advantages of cotton sacks—have been reported. It has been found that bags of this size are easier to handle. They have a further advantage in permitting a free circulation of air and thus preventing decay, which sometimes develops when closed containers are used.

Stockinettes

By P. Frank Ashe
Wynantskill Manufacturing Company
Troy, N. Y.

THE BENEFITS which result from the use of stockinette bags for the smoking of hams and bacon slabs are so decided that they are now used by about 90 per cent of the trade. Stockinette frankfurter bags also are rapidly increasing in popularity.

Ham stockinettes are made in a great variety of sizes to cover hams weighing from 2 to 40 pounds and in a variety of weights. While the size stockinette for hams of different weights is standardized to a great extent, the difference of opinion that exists between smokehouse operators as to the weight of stockinette to use is considerable.

Some use a heavy stockinette in which the ham smokes slowly, others use a light-weight bag which retards the smoking process very little, and still others use even lighter weights. Some concerns find it economical to use of stockinette that is heavy enough to stand washing—some style bags can be washed and used over seven times and other styles two or three times—while other packers prefer a light-weight bag which they use for one smoking process only.

While there are no definite figures available on the saving in cost and comparative shrinkage with and without the stockinette, all things being equal there should be a saving in shrinkage in the stockinette process, since the stockinette, if properly put on, reduces the evaporation of moisture. Of course, results will be somewhat affected by the method of shipping meat, depending on whether or not the stockinette is removed at the time of shipment.

The labor cost of trimming after cure is eliminated with the stockinette method; the yield is increased; there is a saving in trim and shrinkage, and a big improvement in the appearance. There is a saving of both labor and wiping material when the stockinettes are used, and also considerable saving in time in the wrapping operation for shipment. It is a well-known fact that naked smoked meat will sweat in damp weather, usually necessitating an extra wiping operation before shipment. The use of stockinette eliminates this extra cost.

There are a great many desirable features in the use of stockinettes in the smoking of hams, but perhaps the most valuable is the sanitation. Without a doubt the ham is more often handled than any other cut of meat. The use of stockinette keeps flies, dust and unclean hands from contact with the ham from the time it is put on the machine to be stockinetted until it is opened for use. Sanitation is an important consideration also in the use of stockinettes for covering beef quarters, calves, lamb, pigs, as well as many other cuts.

Metal Foil

By W. C. White
Aluminum Company of America
Pittsburgh, Pa.

A WINESAP APPLE is one of Nature's beauty packages; a coconut embodies her ideas of durability. Prodigal Nature, however, places no dollars and cents value on time and materials, while man in wrapping his manufactured food products must choose with an eye to cost, as well as to utility, durability and an attractive appearance.

The proper balance among these various considerations, which a newspaper headline writer might term "Price, Protection and Pulchritude," varies with the commodity to be packaged. Foil has most frequently been used where the need for protection to the product and the desire for its enhanced appearance have been important. For this reason foil has established during the past several decades a definite idea of quality in the mind of the buying public, although its cost is low, as is indicated by its use on 1-cent chewing gum sticks and on cigarettes of an extremely narrow margin of profit.

The use of metallic foil for food products wrapping during 1929 has been characterized by research designed to fix within narrow limits the unusual ability of various foils to exclude moisture, light and radiant heat. Foil-wrapper users who first adopted metal wrappers, both as a moisture seal and for their appearance, have come to realize the value of a sheath of metal in excluding light and heat rays.

In the case of a foil-wrapped package exposed to sunlight, a favorable heat-insulation effect is to be expected from the foil. In the petroleum industry, aluminum foil is in active use as a heat-reflecting coating for oil tanks, on which the foil is applied like wall paper, over a newly developed adhesive. The extent to which heat is reflected is shown by the result of "foiling" the roof of a newly painted 80,000-barrel tank. The maximum temperature in this tank was consistently 40° to 45° lower than in an unpainted tank, on an average hot summer day.

Experiments have been initiated to determine what damage may be done to food products of delicate flavor by the action of light. With dairy products, for example, tests have been conducted by several of the larger butter-producing organizations. While maintenance of original weight has been found to be one of the advantages, and one which often offsets the cost of foil wrapping, the ability of foil to exclude foreign tastes and odors and to seal in the original flavor and aroma of the product

has been so nearly perfect as to surprise the various experimenters.

These results have a close connection, no doubt, with the findings of chemists in investigating the effect of light on milk fats, an effect evidenced by the "cardboard" taste and "linseed oil" odor which develops in whole milk or cream that has been exposed to light, even to diffused light at low temperatures. William C. Frazier of the Research Laboratories Bureau of Dairy Industry, U. S. Department of Agriculture, discusses in *Journal of Dairy Science*, this catalytic effect of light in the oxidation of milk fats. He states that exposure to diffused light for eight or more hours is sufficient to develop the defective taste and odor noted in all of the milk samples tested from a number of sources. Further research may identify daylight and radiant heat as contributing factors in the deterioration of other food products, whether or not milk fats are present in them. A consideration of the extent to which various types of foil offer a barrier to such light and heat promises to interest additional manufacturing companies as time goes on.

Such experiments lead the way to more exact determinations in specific instances. They are interesting at this time in that they seem to forecast, for all wrapper materials, a closer calibration of performance in ways previously not considered important.

The visual attraction that foil possesses accounts for its widespread use by show window decorators and in other fields where it is chosen purely for its pleasing appearance. Recently a prominent foil manufacturer has developed the sale of assortments of varicolored foils for the "home-art" decoration of trays, lamps, and similar objects.

The aluminum or tin foil wrapping in which tea is retailed is eloquent testimony of the power of foil to preserve, for the delicate flavor of tea is proverbial. Yeast wrappers of aluminum or tin foil are likewise familiar to millions of families to whom the strict laboratory control of yeast production and the many safeguards to its purity may not be so well known. The almost universal use of aluminum foil for chocolate bars emphasizes the fact that foil meets production demands in a field where low-cost, high-speed operation is added to severe requirements of protection. Cake, cheese, butter, chewing gum, confectionery, ice cream, cigarettes, cigars, tobacco, coffee—all demand types and styles of tin or aluminum foil that will perform its special duty to the product.

Foil is metal, and when the proper metal is chosen for the desired purpose, the foil wrapper combines attractive appearance and a permanent protection for the product, at a price which is well under the worth of these two valuable assets. Year by year, manufacturers standardize more firmly on foil wrappers which invite buyers to purchase a product that has been freshly kept.

STYLES OF FOIL FOR VARIOUS PRODUCTS

Unbacked Foil

Bottles (usually lacquered; plain or embossed foil).
Tea (usually plain foil).
Yeast (plain foil).
Confections (plain or embossed; often lacquered foil).
Cheese (plain foil).

Wax-paper Backed Foil

Cake (usually embossed and printed foil).
Candy Bars (printed; plain or embossed foil).
Cheese (printed; usually embossed foil).
Chewing Gum (plain foil).
Cigars (embossed foil).
Ice Cream Bars (embossed, printed foil).
Sausage (embossed printed foil).
Soap (printed, plain foil).

Special Backing Foil

Cheese (special paper foil).
Cigarettes (glue lined paper foil).
Coffee (asphalt or glue "lined" paper foil).
Tobacco (glue "lined" paper foil).

Foil Covering Areas Per Pound
(Square Inches)

Thickness (Inches)	Aluminum	Tin	Lead
0.0003	34,000	12,600	8,100
0.00035	29,200	10,800	6,950
0.0004	25,600	9,450	6,075
0.00045	22,700	8,380	5,400
0.0005	20,500	7,550	4,860
0.0006	17,000	6,280	4,050
0.00065	15,700	5,800	3,730
0.0007	14,600	5,400	3,475
0.0008	12,800	4,730	3,040
0.001	10,250	3,790	2,430
0.0015	6,800	2,510	1,620
0.002	5,100	1,880	1,215
0.0025	4,100	1,520	970
0.003	3,400	1,260	810
0.004	2,550	950	610
0.005	2,050	760	485

New Ways of Using Metal Foil

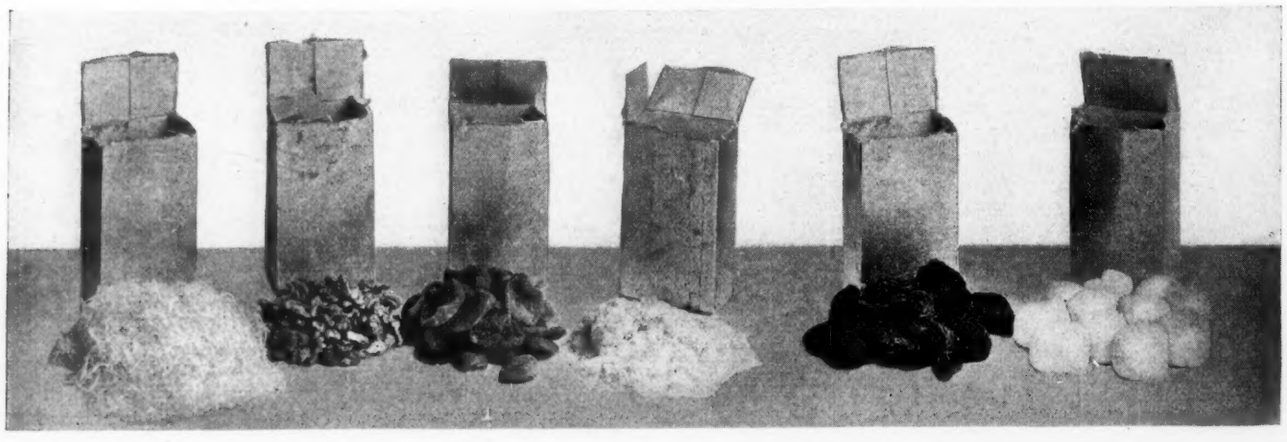
By F. H. DREXLER
Reynolds Metals Company
Louisville, Ky.

FOIL is ordinarily used in connection with a paper backing. Tissue, bond, parchment, manila, and glassine have been used not only to reinforce the foil but to bring those additional elements of protection that serve to make the foil-paper wrapping unequalled for utility and protection.

A more recent development in the foil field is the metal foil-surfaced or foil-lined carton. This carton consists of the usual paper board combined with a thin sheet of metal foil by a waterproof cement. A carton of this kind possesses most of the advantages of both metal and paper containers. It is moisture-proof and airproof, light in weight, has a striking appearance, and is inexpensive in cost. These foil-surfaced cartons are desirable as much because of their sales value as because of their keeping qualities.

Foil tight-wrapped packages after two weeks in a laboratory humidor under identical conditions with paper-wrapped packages shown opposite.

Coconut *Nuts* *Dried Peaches* *Jello Powder* *Prunes* *Marshmallows*



These cartons are available in all types—top-openers, end-openers, glue-enders, and display cartons. Tea packers are finding these cartons useful for packing half pounds and quarter pounds, for they not only do away with the foil liner formerly used but, by having the foil outside the carton, provide a package of high attention value.

Another development with far-reaching possibilities for the food industries is the foil-surfaced tight-wrap. This consists of an impervious sheet of foil bonded to paper by a waterproof cement and sealed around a paper shell or carton in the same way as a paper wrapper. The metal surface provides remarkable preservative qualities. Several months ago, in a series of tests conducted with prunes, it was shown that under normal conditions a foil tight-wrapped package suffered only 3 per cent loss in weight by shrinkage, while a waxed-paper package lost 7 per cent, and a dry-paper wrapped packed 15 per cent.

Another series of accelerated tests was made in a laboratory humidor on prunes, apricots, nuts, marshmallows, and gelatine, with both the paper tight-wrapped and the foil tight-wrapped packages. When the paper carton was opened, the contents was found to be covered with mold and totally unfit for consumption, whereas the contents of the foil-covered package was as good as the day it was packed.

The value of such a package in the dried-fruit industry is certainly evident when one considers the tremendous loss from shrinkage and returned goods, and the severe tests which the foil tight-wrapped package has passed promise an increasing use for this protective covering in the future.

Tin Cans

A brief review of the general-line can, and a summary of the 1930 status of the packer's can, based on the better practice of the canning industry

FOOD INDUSTRIES STAFF

THE hermetically sealed cans in which foods to be sterilized by heat are packed is referred to by the trade as a "packer's can." Cans for products that do not require sterilization by heat in a bacteria-tight container are customarily referred to as "general-line cans." The kinds of foods that are sold in the latter comprise a large list, some of the more important being baked goods, including cakes, cookies, biscuits, wafers, ginger snaps; confectionery, including candies of all sorts; oils, such as salad oil, corn oil, cottonseed oil, olive oil; sirups, such as corn sirup, table sirups, maple sirup, honey, molasses; coffee, tea, and spices of all sorts; baking powders, cocoa, powdered milks, all sorts of prepared foods, of which malted milk may be taken as a type; and, lastly, nuts.

So-called "canned foods" are defined as foods that are packed in hermetically sealed containers and sterilized by heat. General-line cans often differ in construction from packer's cans, because the latter must be able to withstand heat treatment, its consequent internal and external pressures, and their resultant strains. As the heat treatment is primarily for sterilizing the contents, the packer's can is chiefly used for perishable foods, while the general-line can is for non-perishable foods. This distinction, however, is not absolutely rigid.

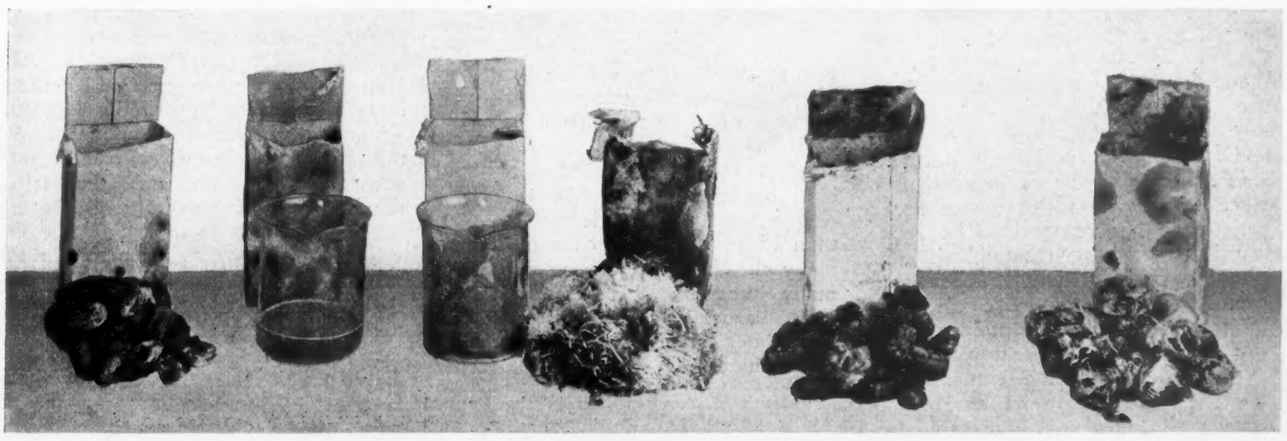
General-Line Cans—Packages and containers for non-perishables range from a sheet of wrapping paper to barrels, making it obvious that technological reasons should govern the choice of the container. Liquid products demand a breakage-proof container that is also leakproof and capable of tight closure. For this purpose the general-line tin can is very serviceable. An added feature is its adaptability to direct decoration with colors

Products that are easily affected by moisture must, of necessity, be packed in containers that are impervious to it. Hence such substances as baking powder have been habitually packed in tin cans, for the admission of a very small quantity of moist air would cause deterioration of its leavening power. Another group of foods suitably packaged in tin cans includes those that carry volatile flavors or flavors easily changed by atmospheric oxygen. Coffee, particularly cut or ground coffee, represents one of the extreme types of this group, and nearly everyone is familiar with the need of tight packages for coffee. Probably more attention has been devoted to proper packaging of this single product than to any of the other products the chief value of which lies in volatile flavor. Many firms that take special pains in producing the finest possible package of coffee use a vacuum package in order to eliminate the possible influence of air in the can.

Although spices may be shipped in bags, frails, and other loose containers when they are in the form of whole spices, the problem of packaging becomes quite different after the spices are ground, and unless the package is a tight container, the essential oils constituting the chief flavoring materials of spices escape by volatilization.

Paper tight-wrapped packages after two weeks in a laboratory humidor under identical conditions with the foil-wrapped packages shown opposite. The marshmallows were reduced to a liquid and the powder to a moist jelly. The peaches and coconut were overgrown with mold.

Dried peaches *Marshmallows* *Jello powder* *Coconut* *Nuts* *Prunes*



Even ground pepper, which is less liable to this form of deterioration than most of the spices, is better for being packed in a tight container.

Baked foods, having a greater appeal to the palate when crisp, are another large class of product to which the metal container—such as the tin can—is an appropriate package; protecting them both from partial deterioration due to moisture and from insect pests. As they come from the oven such foods are free from insects or their eggs and, if packaged in a tight can lined with sterile liners, will remain free from such insect infestation.

Characteristics that are of value to the food manufacturer from the point of view of sales appeal are inherent in nearly every type of food package. An important feature of the tin can in this respect is its ease of decoration. Tinplate can be easily lithographed, and lithography on tin will withstand moisture and a great deal of rough handling. The high reflective power of the tin underneath the colored lithographed surfaces produces a brilliant effect.

One important feature of all containers—a very important one—is the ease or difficulty with which it may be opened and the contents removed. Tin containers present a variety of closures, each of which is adapted to the needs of the product. Cans for salad oils have very thin tin seals that usually are punched with an ice pick or a nail. Then there is the familiar slip top frequently found on baking powder, coffee, and cake tins; the friction top of the sirup can, and the screw top often found on tea cans. For those who choose to take the most elaborate precautions with their product, there is the key-opening can with an inside collar that permits the continued use of the cut-off top as a slip cover until the contents are consumed.

When vacuum packing is employed, the seams of the can must be made with the aid of a lining to insure airtightness, as in packer's cans designed for canning purposes. When the needs of the product are such that a looser can may be used with safety, the lining may be omitted with a trifling saving.

General-line cans are available in a variety of shapes. The simplest and cheapest is the cylindrical—so-called "round"—can. It requires less material per unit of volume for its manufacture than any other practicable shape, and is easier to fabricate. Moreover, it is easier to handle in the food plant, since it may be rolled where square cans must be conveyed. The square can, however, has an individuality that gives it certain advantages over the round can; it packs more advantageously into a carrying container, lowering the ratio of the cost of the case to the volume of net contents. On the shelf in a store its flat surfaces present its label or lithograph in a manner that the purchaser may easily see. The choice between round and square cans often depends on this shelf appeal and space economy in the shipping case.

Packer's Cans—In the seven years that have passed since the last review of the status of the tin can was published* the many new developments that have occurred, both in canning and can making, warrant a recapitulation of the place that the tin can now occupies in the preservation of foods. Oddly enough, although methods of manufacture of tinplate have not been improved to a noteworthy extent in this period, the present-day packer's can is a container that is generally improved over its 1923 status.

Types of general-line cans

The story of improvements in the tin can in the past seven years largely is the story of the development of new and better enamels. By supplementing the protective tin coating on the base plate with enamels, the solutions of the more important problems of the tin can that existed seven years ago have been largely found. By this means one of the most vexatious of all canning problems—the unsightly black discoloration of canned corn and certain shell fish—has been permanently eliminated, and, as so often occurs, the new weapon of defense brought into being through the discovery of the new enamels has now been found to be an effective means of eliminating other minor problems that once seemed to be unavoidable.

After years of intensive experimentation by the research laboratories of can manufacturers, the National Canners' Association, and even agriculturists, it has been found that the minute quantities of hydrogen sulphide given off by many foods when subjected to heat can be chemically held fast at the interior surface by proper ingredients in the enamels. The admixture of extremely small amounts of insoluble zinc oxide in the enamel has provided a means of eliminating corn black. Although the remedy is simple, the search for it required more than 15 years, the services of a great many chemists, and the expenditure of many hundreds of thousands of dollars. Its original name, "corn enamel" was later contracted to C-enamel. After the discovery of its effectiveness for corn canning its use spread rapidly to other products where harmless but unappetizing discolorations have appeared, and most of the peas, beans, and shell fish are now packed in tin cans having interiors coated with special enamels.

Of an importance little below that of the discovery of the new enamels is the development of greatly improved gaskets, or liners, for the so-called sanitary or open-top can. In this type of can it is necessary to have a compressible lining or gasket between the tinplate that forms the ends of the can and the body to insure an airtight and bacteria-tight joint. The earliest gaskets were made from soft paper, but were not satisfactory. Slopping of wet contents of cans in the final closing operations sometimes wet the paper gasket and caused imperfect closures and consequent spoilage. When the seams were not tight the possibility was always present that air could slowly leak into the can.

The first step of improvement was the "plus gasket"—so designated because it was, in reality, two gaskets—a paper gasket *plus* a compound gasket. In this case the "compound" was an elastic material made from rubber dissolved in benzol. Two years later the present-day gasket was introduced. It has a rubber latex base, and now meets all the objections to the older forms of gaskets. It will not fall out, and it is sufficiently easy to apply to insure a perfect gasket in the end of every can.

Although the new enamels are capable of making the tin can a container eminently more satisfactory to both canner and consumer because of its more attractive interior appearance, the day probably is still far off when the can will consist only of steel plate coated with enamel. The reasons for the continued necessity of using tin on the can are to be found in electrochemical theory still too far in the realm of speculation to justify inclusion in a recital of facts. The most that can be said at this time is that the tinless steel container has not even reached the experimental stage.

Although experimental work with aluminum cans now being carried out in certain European countries has inspired similar experiments in the United States, they are still in the early laboratory stage of development. To make containers of aluminum at the present time, however, would entail a cost that would be more than triple the present prices of cans.

Following this summary of the developments that have occurred in the manufacture of tin cans, it is now desirable to consider the specific can or enamel that is suitable for the more important foods that are to be hermetically sealed and sterilized by heat. Necessarily the list does not include every food packed in cans.

*Status of the Tin Can in the Canned Foods Industry, H. A. Baker, New York, 1923.

Asparagus—For many years the plain can has proved satisfactory, but experiments are now being conducted to determine whether packing asparagus in enameled cans will increase its quality. Indications point to a better preservation of the natural color and flavor when packed in enameled cans, but it is still too early to make recommendations. Asparagus has the property of dissolving the tin coating, leaving the interior of the can dark, but no discoloration of the product is involved.

Beets—Only enameled cans should be used for this product. The agriculture of the beet—namely, the selection of the proper seed and choice of soil which will insure the proper development of color—will do much to avoid the muddy appearance of canned beets, formerly attributed to the influence of the tin can. When beets are packed in plain cans the color is bleached to a dirty white.

Baked Beans—Plain tin cans are satisfactory for this product when properly packed.

Lima Beans—The C-enamel can is the most suitable, but has not yet been generally adopted by canners. It is safe to predict that in the future all lima beans, whether fresh or dry, will be packed in this type of can to eliminate the purplish discoloration that occurs when they are packed in a plain can.

Red Kidney Beans—Many packers now use cans lined with C-enamel for packing red kidney beans because all discoloration of the interior of the cans has been completely eliminated by this method.

String Beans—The plain can is quite satisfactory for string beans, but a number of packers have been experimenting with the enameled can during the 1929 season. When packed in enameled cans, the product has a color and flavor that more nearly simulates that of the fresh vegetable. Because the consumer has become so accustomed to the slightly altered color and flavor of the usual canned product, string beans in enameled cans appear unnatural. String beans in plain cans have the property of dissolving the tin coating to a considerable extent—much greater than that of acid fruits. When this happens the interior of the can becomes dark, but there is no discoloration of the product.

Corn—The tin can lined with C-enamel is a satisfactory container for this product. The old problem of discoloration due to black iron sulphide has been completely eliminated by this method. The trifling quantity of zinc oxide in the enamel has the function of capturing any hydrogen sulphide and converting it into white zinc sulphide. Infinitesimal quantities of zinc, dissolved from the enamel by the corn, are innocuous in the light of the recent studies of the Harvard School of Public Health. (Fairhall and Walker: Foil Wrapped Food Material; FOOD INDUSTRIES, 1; 642; 1929.)

Hominy—The problems of discoloration formerly were charged against the container, but it is now known that when hominy is properly prepared, no discoloration will result unless trouble is caused by leaks. Plain cans are used for hominy and there is no need for using enamel.

Okra—Plain cans coupled with proper handling of the product in the cannery insures the absence of the discoloration that has been associated with this article in the past. The problem of discoloration is independent of the container, but is capable of control by the packer.

Peas—The trifling amount of rust that formerly occurred in peas packed in plain cans is now completely eliminated by the use of the C-enameled can. With this enamel no iron sulphide discoloration occurs. It is probable that after the next two years no peas will be packed in plain cans.

Ripe Olives—The plain can is recommended, and presents no problems with which the container has any relation.

Sweet Potatoes—The blackening of sweet potatoes that has caused a great deal of trouble in the past, is now believed to be due largely to improper choice of potatoes rather than to the older explanation that voids present in the can contained sufficient air to cause the blackening. It has been demonstrated that those parts of sweet potatoes that have been adjacent to trimmed-off rotten spots will cause blackening. The future tin container for the sweet potato will probably be a C-enameled can and it is also a probability that vacuum packing will be employed.

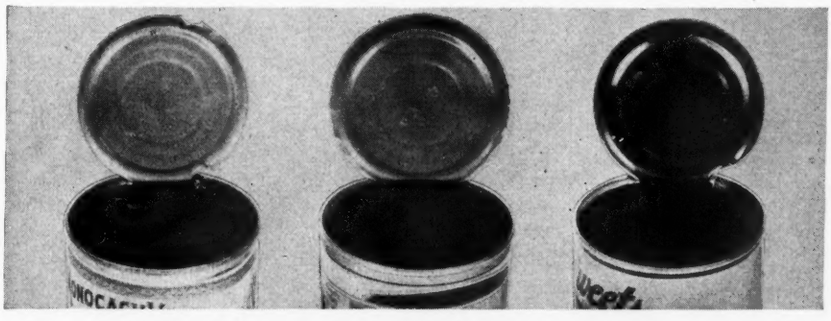
Pumpkin and Squash—Only enameled cans should be used for these products, as both pumpkin and squash dissolve the tin to an unusual degree. When an enameled can is used, no detinning can take place. The product should be filled hot into the can, allowing practically no head space. Where a head space is allowed to remain, discoloration will take place on the surface of the pumpkin or squash. This discoloration would also take place if the container were of glass or some other material and filled in the same way.

Sauerkraut—Hydrogen swells continue to be one of the problems of the sauerkraut packer. Enameling the interior of the can will not eliminate this trouble. The remedy is to give a high exhaust and to allow sufficient head space for the accumulation of the hydrogen that inevitably forms when the product is packed in plain cans, by limiting the fill. The basic problem is not solved in this way, but the cans do not become hydrogen swells or springers. In limiting the fill the packer is required to work very close to the government's minimum standards of fill. After packing, proper cooling and storage at cool temperatures in order to restrain the chemical action which gives rise to hydrogen is a necessity. Plain coke-plate cans are best for sauerkraut.

Sirups—Sirups are always packed in plain cans. In the past a great deal of trouble has been experienced with springers and flippers in pasteurized or processed sirups in hermetically sealed containers. It has been demonstrated that the gas formation which brought about these difficulties is due to a chemical decomposition of some of the ingredients of the sirup when raised to the temperature where this decomposition sets in. Likewise, it has been demonstrated that, after filling at 180° F., cooling the sirup below 100°F. will eliminate all of these carbon dioxide swells that otherwise will develop.

Spaghetti—Spaghetti is in the same class with canned baked beans, and the plain can is a satisfactory container.

Spinach—This is still a product rather difficult to pack, and the can and the closure must be perfect. Much of the spinach canned in the United States comes from California, where the state law requires an exceptionally severe process. The severity of the process results in a heavier cook than would normally be given to spinach if prepared in one's home and, therefore, the flavor is somewhat different from the home prepared vegetable. A great deal of spinach is packed in No. 10 tins and such large containers must be cooled under pressure in the retort to prevent buckling and overstraining of



These enameled cans have been in service about six months. The can at the right has regular enamel. The others have C-enamel. Note absence of discoloration.

the seams. The detinning action of spinach is rather severe, but no discoloration results. Plain cans are used.

Succotash—Because succotash is prepared from corn and lima beans, in the past it has been subject to all of the technical difficulties of canning that have been experienced in the packing of each of these articles separately. Naturally, the remedies for the blackening and purple discoloration, as with corn and lima beans, will be remedied by the use of C-enameled cans. Practically all of the succotash that is packed at present goes into C-enameled cans.

Tomatoes—The use of enamels on cans used for tomato canning is still in the experimental stage and at present tomato packers are using plain cans. The interior of the can is slightly attacked by the tomato acid. Although the interior of the can may take on a dull appearance after a long period, as though it had been detinned, tomatoes do not dissolve a great amount of the tin. The action slows down and practically ceases after about 70 parts of tin per million parts of tomatoes have been absorbed. The tin, of course, is innocuous.

Tomato Pulp and Paste—Tomato pulp is packed in both plain and enameled cans. Where pulp is to be stored in 5-gallon and No. 10 cans, many packers believe that the pulp in the enameled can is in a container that is safer for long periods than would be the case in plain cans. Occasionally tomato pulp may absorb copper from the equipment used in the canning factory, and after canning the copper will plate-out onto the can, producing a corroded or blackened effect. The remedy, of course, is to eliminate the possibility of such a copper contamination. Users of copper or brass equipment in tomato pulp and paste manufacture should remember the fact that while bright copper does not dissolve easily, tarnish is quickly dissolved by tomato pulp. Tomato paste is packed entirely in plain cans. A very important feature of the manufacture of this product is the need for prompt cooling after packing in order to prevent action of the acid of tomato paste on the tin plate, due to the high temperature. If this precaution is not taken, enough of the base metal may be dissolved to give a marked bitterness to the tomato paste.

Tomato and Other Soups—The plain tin container is satisfactory for all soups, although many packers are experimenting with enameled cans with very promising results.

Milk—Evaporated milk is packed almost entirely in soldered vented cans with satisfactory results. Spoilage problems, except in the case of the very largest cans, are very rare, and quality problems in this product are problems of the canner. Condensed milk or sweetened condensed milk depends almost entirely upon the presence of sugar for its preservation and it is not sterilized. It is packed in plain cans and in some factories is sealed in a vacuum closing machine in order to remove enough of the oxygen within the head space of the can to prevent possible molding and "button" formation—the usual form of spoilage when it actually occurs.

Meats—Many products come under this heading, and the troubles of the past have been due chiefly to imperfect closure, and misunderstanding as to the nature and cause of the discoloration that resulted from leakage of air or access of bacteria to the product. Plain cans are used for meat products and all canned meats. Emphasis should be placed on the need of perfect closure in meat cans.

Clams—Canned clams have always given trouble from black discoloration. Long ago it was discovered by a few canners that a small amount of vinegar or similar acid would have a decided effect in preventing the discoloration, but this remedy had its limitations because it affected the taste of the clams. With the discovery that C-enamel would eliminate the presence of hydrogen sulphide from canned corn, it was quickly applied to canned shellfish. Today all clams should be packed with the special enamel, making vinegar unnecessary.

Lobster—All of the old troubles of discoloration in canned lobster that were formerly experienced are now solved by the use of C-enameled cans and all of the largest packers—approximately 75 per cent of those now in the business—are now using them.

Oysters—The plain tin can is satisfactory for oysters.

Salmon—Most of the cans used in the Alaskan regions are shipped from American plants in collapsed condition and are re-formed at the canning factories where the bottoms are put on. Plain can is recommended. Salmon flesh has a very low rate of heat penetration and to get a proper exhaust has always been a problem to the salmon packer. This explains the large number of springers and flippers that heretofore have been found in canned salmon. To get away from this difficulty the vacuum closing machine has been introduced. In 1929 more than 300 such machines were in use in salmon canneries alone. The machines will close the can in a high vacuum and produce a perfect exhaust. The interior surfaces of salmon cans are always stained to a dark color, but this is regarded as entirely normal.

Sardines—It is a rather curious fact that up to a few years ago the sardine was not always actually hermetically sealed. This was due to the fact that the older closing machines were incapable of doing the perfect job on square and oval cans, now possible today with the latest type of closing machines. The fact that the older loosely sealed canned sardines did not show more spoilage was due to their dryness, the saltiness of the fish, and the covering of oil. Today, however, they are hermetically sealed and, when sterilized by heat, do not depend upon the other factors for their keeping qualities. Plain, coke-plate cans are used for sardines.

Shrimp—The tin container is satisfactory for shrimp if it is properly packed and properly sealed. Wet packed shrimp, however, has the disadvantage of softening when held in storage for a prolonged period. C-enameled cans avoid all of the former problems of discoloration, but nevertheless the trade frequently demands the parchment liner that has become customary in the shrimp can. The black discoloration due to copper must be avoided by insuring that nothing comes in contact with copper in the process of preparation of the shrimp.

Tuna—Plain cans are satisfactory for canning tuna fish. While no serious troubles are experienced with the container some packers are using enameled cans because of their consumer appeal.

Apples—Plain cans are recommended for all apple packing. The solid pack, as contrasted with the loose pack, is the accepted method of packing apples today. Only a few packers continue to employ the older method. Many packers soak their apples five to twelve hours in a 3 per cent salt solution in order to remove air, following this by steaming. The function of the salt is to prevent the apple from discoloring, but it should be pointed out that salt in canned apples has the very bad effect of accelerating perforation, and only the least salt possible to prevent discoloration should be used. Extra-heavy tin plate is not necessary for canned apples where proper canning methods have been employed. With the advent of the present methods of packing solid-pack apples, insufficient processing has been the cause of some trouble, because canners have failed to realize that the heat penetration of the tightly filled can is greatly reduced.

Apple Butter—Apple butter possesses all of the characteristics of canned apples, so far as ability to perforate the can is concerned, plus a few additional ones. In the past, it has been felt that apple butter was safest when packed in glass containers, but it is now known that the large quantities of air which are dissolved in apple butter during the course of its manufacture can be removed. This eliminates one of the most potent sources of trouble with this product. Both plain and enameled cans are used.

Berries: Strawberries—There is little new to contribute to the subject of canning strawberries at this time, for the problems of perforation of this product are not yet solved. Those

who pack strawberries usually employ enameled charcoal A cans.

Blueberries — Ninety-eight per cent of the blueberries in this country are packed in plain, coke-plate cans. Enameled cans are used only on special orders where the customer has specified this protective coating. The reason for this is found in the fact that perforation will be tremendously accelerated in an enameled can. The merchantable life of the blueberry in plain cans is only about twelve months at ordinary storage temperature, and in enameled cans it is materially less.

Huckleberries—Fortunately, the pack of huckleberries is rather small, as this berry presents a special problem. Its more delicate color, in contrast with the blueberry, really demands the use of an enameled can in order to protect the color, but when the enameled can is used, the enamel practically insures that perforations will occur in every can.

Cranberries—Cranberries are packed at present in the form of cranberry sauce, either as whole or as strained sauce, in enameled cans using charcoal A plate. Cooling after filling is a very important factor in holding the original color. When the cans are filled with hot sauce at a proper temperature, no process is necessary.

Black Raspberries—The black raspberry has a merchantable life of only about 12 months in a tin can under normal storage conditions. The better packers use plain cans made from coke-plate.

Red Raspberries and Loganberries—Among the berries, the red raspberry and the loganberry are considered to be safer products to pack commercially than the other berries. Although perforation sometimes occurs, the business of canning either of these berries is not the gamble such as is found in the canning of strawberries. For these products the enameled can made from charcoal plate is used.

Blackberries — Usually plain cans are used for the small pack of blackberries that is put up, and the No. 10 can is the usual container. The merchantable life of canned blackberries is very short.

Cherries—White cherries are always packed in plain coke-plate cans. Canners are still in the dark as to the proper procedure in packing black cherries and hence very little of this fruit is canned. Of all the food products that are put into tin cans the black cherry is probably the most certain to perforate the container.

Red Sour Pitted Cherries—Nearly all of the earlier troubles occurring in the canning of red sour pitted cherries have been eliminated by the use of the long exhaust and by canning the cherries in enameled cans made from charcoal A plate. It should be stated at this point that the hot-water exhaust box which is now available came into existence to satisfy the need of canners in obtaining a thorough high-temperature exhaust. In packing r.s.p. cherries it must be remembered that speed in handling after pitting, and thorough cooling after processing, are almost as essential to get the best quality as the proper can.

Cider—Apple cider in plain cans made from coke-plate has been packed by some packers with success. Of great importance is the complete removal of air from the cider by vacuumizing at low temperatures and processing at about 175° F.

Grapefruit—Much progress has been made in the canning of grapefruit during the last two years. Plain tin cans are a satisfactory container. Perfect closures are imperative. One of the peculiarities of this product is that it must be allowed to stand for a considerable period of time immediately after it is packed in order to allow the fruit cells to assume a firm condition and permit them to be shipped without complete disintegration.

Jams and Jellies—These products are usually packed in enameled cans.

Green Olives—Plain coke-plate cans are occasionally used for packing green olives. Before packing, the acidity of olives must be properly adjusted and, when sealing, a strong vacuum must be pulled in the head space if hydrogen swells and springers are to be avoided.

Peaches, Pears and Apricots—The plain tin container is used for these products. Any perforations that occur are caused by defective closures.

Pickles — Enameled coke-plate cans are best for dills, sweets, and sours. A proper vacuum is necessary in the head space. This may be obtained either by a heat exhaust or by the easier method of using a vacuum-closing machine.

Pineapple—The plain tin can is used. Curiously enough, perforations from the inside of the can never occur with pineapple except where the closure has been defective. Perforations will, however, occur very readily from the outside if pineapple juice is splashed upon it.

Plums—Problems similar to those encountered in packing cherries are found in packing plums. Those varieties whose color will permit packing in plain cans are the safest to can. Enameled cans are used almost exclusively for Italian plums.

Prunes, Grapes, Raisins, and Figs—Figs are packed almost entirely in enameled cans. Prunes, grapes, and raisins are more satisfactory in enameled cans but in this container there is a greater degree of perforation than with the plain can.

Rhubarb—Although a very satisfactory article on the table, canned rhubarb has not been very successful as a canned product except where it was kept in the can for extremely short periods of time. The acid of rhubarb will readily dissolve tin and produce hydrogen gas in sufficient pressure sometimes to form hard swells. Enameling the interior of the can has never been entirely successful in preventing this corrosion problem because the acid of the rhubarb has a tendency to get under the enamel and peel it off. Curiously enough, however, rhubarb never perforates the can. When rhubarb is packed with heavy sirup, the protection offered by the enameled coating is surprisingly increased, but rhubarb packed with heavy sirup is not an economic success. One of the latest developments in the packing of rhubarb consists in soaking it in warm water at a temperature of 120° F. thus removing a great deal of the air from the rhubarb, and eliminating the oxygen that aggravates corrosion.

Glass Containers

By KARL L. FORD
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OVER one hundred years ago Nicolas Appert developed the art of food preservation by the application of heat. He chose glass "as the material most impermeable to air." As a pioneer in a new field he encountered difficulties which he overcame by attention to the minutest details. When the crude methods he was compelled to employ are compared with present-day practice, his accomplishments appear even greater.

Glass in any form is just glass to many of its users. Their experience along certain lines has acquainted them with one or more of its physical properties confirming their opinion, either favorable or unfavorable, of glass. But in reality there exists a wide variety of glasses possessing a similar variation in physical properties. Adjustments of its chemical composition can change physical properties by a ratio of two to one, or an even greater ratio. Such changes are made to adapt glass for specific uses in industry.

In the field of optics glass serves a number of purposes for which chemical composition is carefully controlled. The refractive index can be changed; light rays can be transmitted or absorbed, as desired. Some glasses transmit ultra-violet and no visible, or the reverse. Others transmit the infra-red and no visible, or the reverse. We can now obtain special window glass which transmits the ultra-violet rays of sunlight. Each of these, while of the glass

family, shows different properties and widely varying applications.

A vast range of colors is possible with glass. Some of the modern glass containers have tints which enhance their appearance or serve as a protection against light.

Chemical glassware must withstand corrosive action and sudden temperature shock of rapid heating and cooling, and yet it must be made thick walled for ruggedness. Here chemical resistance and a low coefficient of expansion are the essential properties. These are obtained by making a glass which differs radically from any other member of the glass family. The extent to which these special properties are developed beyond the common lot in a measure determines their cost, because of the additional expense of manufacturing.

A food container is likewise a special glass. In this article are combined durability, resistance to temperature shock, optical characteristics, color, and strength. Since the cost must not be excessive, some compromise must be made regarding physical properties. Therefore, the superior resistance of chemical glassware or the special light-transmissive powers of optical glass cannot be expected of the commercial glasses employed in food containers. The food packer can expect and does obtain a glass of a chemical composition with sufficient durability and resistance to temperature shock to meet the general requirements of the food-packing field. This glass is the result of extensive studies in the art of glass manufacturing.

With the advent of the machine-made glass bottle and jar production costs decreased, uniformity of finish and capacity were assured, and quality was improved. In addition to the automatic bottle-forming machine has come improved mechanical lehrs operated under

Glass containers for beverages

automatic temperature control, and annealing of glass in accordance with the most advanced scientific researches. Composition no longer is a matter of tradition but of exact, technically established batch proportions composed of the materials selected to give special physical properties. As a final check, laboratory control of every step in the operation has become standard practice.

A milk bottle receives repeated washings in strong alkaline solutions, is roughly handled and yet its average life is approximately thirty trips. In the process room glass containers may be subjected to a process temperature of 250° for an hour with 20- to 30-minute heating and cooling periods, without failure. Food products can be held in storage for years in glass without evidence of any effect in the ingredients. To say that the ordinary glass container is adaptable without change to all types of products, both food and pharmaceutical, is demanding the properties of the entire glass family from one member. Now and then when some exceptional product toward which the resistance of glass has never been determined is packed the container appears to be the guilty party in failure. When such failure does occur, no hasty decision should be rendered. Possibly a minor change in the method of packing or the glass composition might solve the problem, as experience has so often proved to be true.

One request occasionally presented to the glass manufacturer is for an alkali-free glass. Such a request might be granted, but the packer would hedge on the price he would be asked to pay. In effect, he wants a glass in which the extraction of alkaline material from the glass is beyond the power of the solutions or process for which it is to be employed. This is a problem of the glass industry comparable with the corrosion of metals and it has received a vast amount of attention. Arbitrary standards with tests to support them have been established by users, and the glass manufacturer has met them. The literature and the laboratory files contain records of these attempts to produce glass of low alkaline solubility. Many of these in regard to certain products are closed books, with the final solutions recorded. No doubt there are some ahead still unsolved, for the glass container is finding new uses. A few are in the laboratory at the present time. But they represent exceptions—not the rule—for the developments accomplished to date have produced a durable glass. This is especially true in regard to the ordinary food products packed in glass.

The closure completes the glass container. It serves as a hermetic seal. Applied by automatic capping machines sealing the containers under a vacuum, the modern closure is a far cry from the laborious stopper seal of Appert. One wonders what he might have accomplished with a modern closure at his command.

No food packer need lack a closure suited to both his product and his desires, whether they be financial or aesthetic. The list of closures is long and extremely varied. Differences in appearance, methods of application, methods of removal, reseal features, material speed of operation, and cost afford the customer ample basis for selection. Back of each is more or less experience and research available for the guidance of the user.

In selecting a closure, attention must be given to the liner to be employed. The liner is that part of the closure which makes contact with the glass and with the contained product. Varnished paper, natural cork, composition cork, rubber, composition rubber, indicate the variety in the nature of the liners. The purpose for which the closure is intended determines to a large extent the type of liner, although certain liners possess rather widespread application. The sealing of a dry powder under vacuum requires a different liner from a brine packed vegetable product. Likewise a liner that would not be effected by the sirup of a fruit pack would be seriously damaged by the fat of a meat product, which is subjected to a much higher process temperature than the fruit. Full regard should be given to the advice offered concerning the liner

Glass containers and caps for solid products

to be employed, because it is an all-important factor in obtaining an effective seal.

In closing machines the packer has considerable opportunity to select one suitable to his requirements. Hand- or foot-operated capping machines are available for the small concern. Simple chamber vacuum-sealing machines self- or power-driven can be obtained. Full automatic high-speed capping machines, either vacuum or non-vacuum, are obtainable to fit into a packing line.

To list the food products packed in glass would require considerable space. The vital question is, why are these products packed in glass? What particular merit does a glass container possess and what are its limitations? From the discussion of the properties of glass it is evident that it has certain inherent characteristics which make it an ideal container, particularly its property of resistance to corrosive action of dilute acids and alkalis. Its transparency is a feature which affords a direct return for the expense involved in a quality pack. The ease and permanence of the vacuum closure are distinctive features. The initial cost of the container and its weight are limitations which must be recognized. The fragility commonly attributed to glass can hardly be applied to the modern glass container when the extremely low breakage record of efficiently operated glass-packing plants is considered.

Despite the fact that over a hundred years ago Appert used glass as the container for his products, the glass package is a rather new entrant in the field

Many varieties of food products are packed in glass

of modern commercial packing. For this reason information of a strictly scientific nature regarding glass-packed foods is limited. Considerable experimental data and the experience of packing various products are available only for certain types of products and do not cover the entire packing field. But the combined efforts of laboratories connected with the industry, universities, and the government are constantly adding to the fund of knowledge. The material concerning glass packing is available to any packer through the Glass Container Association and its members' laboratories.

One important development is in the field of processing. Here studies of processing methods have established effective and dependable procedure which enables a retort operator to know exactly the temperature within a retort. As is customary with the development of commercial practices, a wide variety of methods has resulted. The examination of many of these and the elimination of some impracticable ones has been one of the forward steps of the industry. At the present time the packer is assured that retort hook-ups and methods of operation which will afford him satisfactory results can be obtained from the industry.

As an illustration of the adaptability of glass, a few representative products are considered. This group is selected to cover not only volume products and different packing methods but radically different classes.

Mayonnaise is distinctly a glass-packed product. A large amount of research work and co-operative efforts of the mayonnaise manufacturers have resulted in a high-class product. Valuable contributions have been made from the laboratory of a glass-container manufacturer. This product represents one of the unqualified successes of the glass container.

As its contribution, the glass container offers a package which can be tightly sealed and yet possess easy and effective reseal features. Due to its inherent durability there is no disturbance of the acid balance of the product, a possible source of failure. The freedom from contamination by metallic salts which would accelerate rancidity is another important contribution. Since color is a potential sales argument, the transparency of glass has market value.

Efforts to suit the container for reuse by the housewife have brought about modification in design. For the same purpose an inner disk is offered the housewife so that she can, with a minimum of expense, obtain the equivalent of a new seal which will serve as a reminder of her original purchase. Attractiveness of the package is constantly being improved by modernistic designs. With a high quality product and the new designs in mayonnaise jars, the packer offers the consumer a strictly modern package.

In another field the packaging of beets demonstrates the successful application of the glass container. The claim that the sale of beets no matter how packed developed from the reception given the glass-packed beets appears to be true, judging from trade reports. Certainly the appearance of the brilliant red miniature beets is sufficient to stimulate the most jaded appetite. It serves as an example of the possibilities for many other glass-packed vegetables. The limitations of initial cost and freight rates which have restricted vegetables in glass are being removed and there is good reason to believe that future packs will show increased volume.

Of the sea food packed in glass, shrimp offers a striking example of a successful effort. Shrimp, possessing a delicate flavor and an exquisite color, demands careful preparation to obtain a quality pack. The development work of the glass manufacturer in co-operation with the packer has ironed out the difficulties, and the glass-packed shrimp of a reliable concern now furnishes the consumer a delicacy of real worth.

As a container for candy, the glass jar has exceptional merit. Serving as a display window itself, it also offers a tight container hermetically sealed, preventing exposure to atmospheric conditions. Once sealed, the air retained within the container is fixed and its effects reduced to a minimum. Moisture effects on hard candies are readily apparent in loss of luster and a sticky appearance. Soft candies exposed to atmospheric conditions may be changed to hard candies lacking any of the attractiveness of true hard candies. Here the glass jar has proved its adequacy as an effective package. To assume that it might serve for any variety of candy is too optimistic in the face of actual tests with various candies. However, the fact that it has proved its worth for certain types of candy is substantiated by the number of candy jars produced.

Citrus fruits and juices packed in glass have not proved to be satisfactory products. While the selection of the glass container as the ideal package for such high acid products appears logical, the methods of packing employed have not produced satisfactory results. Insufficient knowledge of the effect of oxygen on citrus fruit products has permitted the use of methods which seriously reduced the marketable life of the product. Since these early failures, developments in packing methods to reduce the available oxygen within the sealed container have lengthened the storage life of the product. Now a few glass-packed citrus fruit juices are in the market packed by improved methods, which give due consideration to the effect of oxygen. However, those actually concerned in the production of these juices believe that much work remains to be accomplished before the product can be considered entirely satisfactory. One question still unanswered on which studies are in progress is the vitamin C content of such products.

A glass container possesses the inherent characteristics of durability, strength, transparency, and a simple hermetic seal. It can be obtained in various shapes, designs, colors, and finishes for different closures. Successful experiences in widely spread applications justify its popularity.

The Wooden Barrel

By LOUIS F. HORN

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FROM time immemorial the wooden barrel has been used for packing food products. While the science of barrel making dates so far back in history that the name of the real inventor probably will never be known, the ancient historian Pliny, who lived in the first century A.D., ascribes the invention of cooperage to the inhabitants of the Alpine Valley vineyards. The wooden barrel was used in those days for holding the grape juices and wines which formed an important part of the daily menu.

Down the ages, the wooden barrel, deviating none from the original fundamental principles of its construction, has had extended and widened use in the packing of food products. Today it enters every industry that distributes food to the consuming public.

There is a reason for this: The characteristics of the wooden barrel which make it a superior and desirable container for food products are embraced in the principles of strength and sanitary value. Numerous other features could be mentioned, but these are the most salient because they affect, first, the safety of food products in transit, and second, public health.

The safety features of the wooden

barrel are embodied in lines of construction peculiar to itself, not applying to other containers. This construction has been worked out not by accidental methods but along scientific lines. The principle of the "arch," perfectly formed by staves jointed to conform to any given circle, is the first fundamental in wooden barrel construction. As each stave rests in a set position and all are bound by external hoop pressure, the entire assembly of staves and heads becomes a compact unit which forms an acute angle within the head circle and automatically transmits any external shock throughout every item of material. The resilience of the barrel thus afforded, modifies and distributes the force of any shock. This is one of the finest engineering principles ever worked out in package construction. It insures strength and safety.

The sanitary value of the wooden barrel for the transportation and delivery of food products is noteworthy. There is no financial gain for the manufacturer if all that is saved by economical production in subsequently lost in damaged product caused by the use of improper containers. Packing in clean wooden barrels protects food products against spoilage, moisture, atmospheric changes, and contamination, and insures their safe delivery.

These safety and sanitary advantages of the wooden barrel are recognized by food industries, as shown by the many products packed and delivered in cooperage, among which are the following:

Food products packed in tight wooden barrels:

Beverages,
Butter, Buttermilk,
Chili sauce,
Cider,
Clams,
Condensed milk,
Cooking oils,
Cottonseed oil,
Extracts of all kinds,
Fish of various kinds,
Glucose,
Grape juice,
Kraut,
Lard and oleo oil,
Linseed oil,
Maraschino cherries,
Mincemeats,
Molasses,
Mustard,
Nut butter,
Olives,
Olive oil,
Oysters,
Packing house products,
Pickled meats,
Pickles,
Pork,
Preserved fruits and jams,
Sirup,
Soda fountain sirups,
Soft drinks,
Soups,
Soya bean oil,
Strawberries, etc. (cold pack method)
Tallow,
Tomato pulp,
Vinegar,
Vegetable oils,
Water,
Whiskey and wines (medicinal).

Food products packed in slack wooden barrels:

Apples and other fruits,
Baking powder,
Breakfast foods,
Butter,
Candy,
Cereals,
Cocoa,
Coffee,
Cranberries,
Evaporated fruits,
Evaporated vegetables,
Fish,
Flour,
Gelatine,
Glucose,
Mustard (dry)
Meal,
Meat,
Oleomargarine,
Pecans and other nuts,
Powdered milk
Poultry,
Sugar,
Salt,
Spices,
Vegetables, all kinds.

Tight barrels and kegs used for the packing of food products range in size from 1 to 60 gallons, made according to specifications from standard grades of timber, suitable for the particular product for which the barrel is to be used. Special sizes are made for special trade.

Standard specifications of fir cooperage used for pickle, kraut and vinegar have been agreed to and adopted by the cooperage and food industries. Standard specifications for oak and ash cooperage for all commodities, including food products, are in process of adoption by industries interested, to become effective July 1, 1930. This has been brought about through the co-operation of the Associated Cooperage Industries of America, the Division of Simplified Practice, Department of Commerce, and the barrel-using industries.

Slack wooden barrels for packing food products are manufactured from standard sizes and grades of material, staves 28½ and 30 inches in length, heads 17⅛ and 19⅛ inches in diameter. Other sizes for special trade also are manufactured. The slack barrel was the first container standardized by the federal government for packing, storing and shipment of apples; standard barrels for other fruits, vegetables, etc., have also been adopted and are rigidly adhered to.

The tongue and groove slack barrel is designed for use in packing semi-liquid and powdered products. Powdered milk and fine chemicals are extensively packed in these special barrels.

Many of the food products packed in wooden barrels, while delivered in wooden barrels to groceries, restaurants, hotels, etc., are repacked in individual containers for table use and for sale. Condiments, such as chili sauce, catsup, mustard, olives, sweet pickles, and the like, are in many instances repacked in smaller containers from the wooden barrel. The barrel delivery method means better price and lower net cost, through resale of barrel and re-use of individual containers.

To render the best container service that is possible, the cooperage industry is leaving nothing undone to serve the food trade satisfactorily. Through its trade association, the Associated Cooperage Industries of America, rules have been adopted as demands arise covering standard grades and specifications of materials, enforced by an inspection service, as well as rules governing business relations between material producers and barrel manufacturers.

From the many years of service rendered by the wooden barrel in the packing of food products, a close and personal community of interests has developed between both industries. This has brought about a pleasant factor of good will, and the sincere desire on the part of the cooperage industry to give constantly improved container service.

The Steel Barrel

By HERMAN MERKER
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DISCUSSION of the use of steel barrels as a method of packaging food products may at first seem rather out of place among the other mediums and materials of packaging described in this issue of FOOD INDUSTRIES. However, the position of the steel barrel or drum in the food industry is unique, in that it seldom enters the hands of the ultimate consumer but is used for the shipment of bulk materials to the manufacturer.

The steel barrel and drum have definitely established themselves in every industry in which distribution of liquid, semi-liquid and paste products in bulk is contemplated. In the distribution of food products, the question of quality is of great importance, whether the distribution involves a 1 pound package or a 500-pound barrel. Spoilage, contamination, sanitation, cleanliness and neatness of container are as important considerations in the case of the bulk shipment as in the other.

In some instances the use of the steel barrel has been given impetus because storage is necessary during periods when seasonal production exceeds sales. The steel barrel is well suited for storage as well as shipment, because it is readily handled, is rodent- and vermin-proof, and in addition, is water- and air-tight.

In the selection of the proper type container, consideration should be given the type of service for which it is intended. Distance of shipments, location of consumer, length of time in storage, and method of emptying by the consumer are of great importance, as these determine whether a barrel of light gage, known as the single-trip container, or one of heavy gage, referred to as the returnable-type barrel, will best meet the requirements.

The use of the single-trip steel container is somewhat limited in the food industry, because the protective coatings usually required make its cost too great to absorb in a single shipment. Where no protective coatings are required, or in cases when the ultimate destination is not known at the time of packing and shipment, this container may be economically used.

The returnable-type container permits the use of protective coatings such as zinc, pure tin, or special lacquer, and is, as a rule, more economical than the single-trip type. Because of the long life assured by the heavy-gage material from which returnable barrels are made, their initial cost may be distributed over a considerable number of trips, and the container cost per trip may be considerably less than with other types.

The steel barrel, when used for the shipment or storage of food products, must be properly constructed to meet the requirements of the industry and, specifically, the product which is to be shipped. As sanitation is of first importance, barrels with removable heads are preferable because the interior is readily accessible for cleaning and inspection.

Recesses, inward projections, and sharp corners are difficult, if not impossible, to clean in a satisfactory manner, even when the barrel is new, and the construction of the barrel should contemplate their elimination. If the barrel is made from plain steel the interior surface should be free from scale and should be protected against corrosion, during shipment from manufacturer to user, by a coating of edible oil. Where special coatings are necessary, to protect the taste of the product to be shipped, these should be as heavy as practicable and should be applied evenly to assure a smooth, unbroken film over the base metal. Welded joints should be smooth on the interior.

Straight-sided drums of the returnable type usually are equipped with extra I-bar rolling hoops (the corrugated type hoops result in a pocket on the inside of the container which hinders dumping) and are advantageous for use with certain vegetable oils which congeal at ordinary temperature. To empty a drum of this kind it is only necessary to heat the container sufficiently to allow the outside layer of congealed oil to liquefy. When the head is removed and the drum is up-ended, the entire contents slide out in a solid mass.

Bilged barrels of steel are more easily handled than drums and, because no rolling hoops are needed, permit the use of heavier gage steel in their construction, without adding to the tare weight of the container.

The chrome-nickel alloy steels are rapidly gaining favor for use with some products, but the limitations as to size of sheet obtainable so far have somewhat retarded their application to barrels and drums for the food industries.

The proper design and construction of steel barrels and drums is as important as the design and construction of other equipment used in the food industry, and careful attention to the details outlined above will eliminate difficulties resulting from the purchase of containers not proper for the use for which they are intended.

Wooden Boxes

By PAUL L. GRADY
Wooden Box Bureau, Chicago, Ill.

SHIPPING CONTAINERS can either build or destroy business in the food industries. Boxes that are designed and built correctly will deliver their contents in good condition, please the dealers, and make it easier for them to sell the goods. Cheap and inefficient containers that fail and cause damage to food products are the direct cause of ill-will and lost trade.

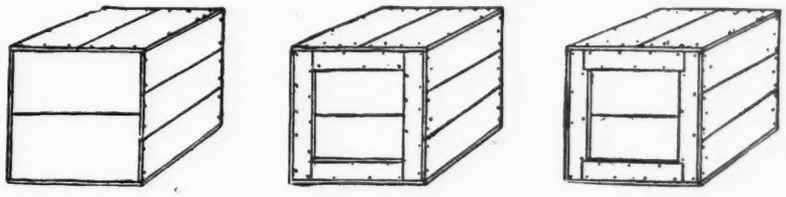
Manufacturers and shippers in the food industries are coming to realize the importance of the shipping container to the success of their business. It used to be that the container was looked upon as an expense item in connection with doing business—a sort of necessary evil—and shipping container costs were cut with little regard for the consequences affecting the efficient distribution of commodities. Now, however, competition has made things different. Food products must be placed on the market in as good condition as they left the packing room if they are to have an eye appeal that sells. Dealers want goods to sell, not claim adjustments, and customers want their food products to reach them in good condition. It is up to the shipping container to get them there that way.

Doubtless the prospective shipper will ask how he may assure himself that his containers are scientifically correct in design for the commodity packed therein and for the transportation conditions to be encountered. Each commodity presents a separate problem. While an effort has been made to standardize boxes, shippers should study their own individual problems, keeping an accurate record of losses and damage sustained in transportation, with a view to improving both container and packing until loss and damage are reduced to a minimum.

Should there be any doubt as to the proper wooden box to use, shippers should consult a competent wooden box manufacturer or communicate with the Wooden Box Bureau of the National Lumber Manufacturers' Association and the National Association of Wooden Box Manufacturers, 111 West Washington Street, Chicago, Ill., or the U. S. Forest Products Laboratory, Madison, Wis. They all have available much practical information gleaned from years of study and experimentation, which will be furnished without charge to those seeking to solve special problems or to improve their standard containers. Furthermore, they maintain complete equipment and personnel for the commercial testing of boxes.

Shippers might also derive much valuable information on the construction of wooden boxes and crates from "Wooden Box and Crate Construction," published by the National Association of Wooden Box Manufacturers, and from "Packing for Foreign Markets," published by the U. S. Department of Commerce.

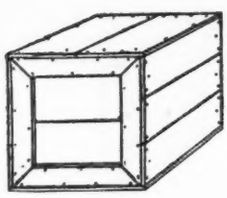
The design and specifications for wooden boxes are influenced by many factors, among them the size and shape, weight, and value of the contents, compressive strength of the contents, and nature of the inside bracing and packing. Given these and other pertinent factors, a competent box manufacturer will be able to design shipping containers of the most economical type consistent with the safe carriage of the contents through to destination. Each box must be designed with regard to both the external shocks it will receive and the nature of the article it is to protect.



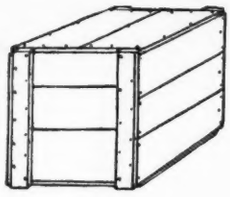
Style 1 *Style 2* *Style 2½*

A properly designed packing box is one which has enough strength in each part for the purpose intended and no more strength in any part than is necessary to balance the average strength in every part. Thus, the nailing will not give out before the top, bottom, sides and ends are effected, nor will these parts shear, buckle, or break across the grain before the cleats give way. A balanced box effects a maximum of protection for a minimum of materials and labor.

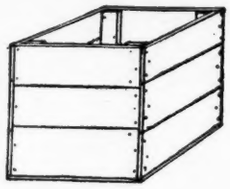
In designing, the size of the container and the weight and character of the contents usually influence the kind and number of reinforcing cleats and battens, if any. Size has a bearing upon the thickness of the lumber, but weight of contents also is a prime factor in this respect. The value of the article to be shipped is an important consideration, for the shipper of valuable goods is justified in constructing a ship-



Style 3



Style 4



Style 5

ping case of exceptional strength to insure safe delivery.

There are seven different styles of wooden boxes the use of which has become so customary that they may be considered standard types.

Style 1 is without cleats and is employed chiefly for small boxes with light contents.

Style 2 has double-cleated ends and is particularly adapted for large boxes with heavy contents because of its strength, due to the cleats and to the double nailing of sides, top, and bottom to both cleats and ends.

Style 2½ is very similar, but with top and bottom cleats set into side cleats, affording support when nailing.

Style 3 has mitered cleats.

Style 4 has single-cleated ends and is suitable for boxes of medium size and weight of contents. The sides have double rows of nailing in both cleats and ends, but the top and bottom have only a single row of nailing into the ends.

Style 5 has interior cleats and is a good type of construction for boxes of medium size and weight of contents. This box may be used when the character of the contents permits, as the construction does not increase the displacement of the box; and for such articles as round cans and those having odd shapes which do not touch the corners of the case it can be employed to advantage. Sometimes the width of the cleat is nailed to the side instead of to the end, and in other instances triangular or square cleats are nailed to both ends and sides.

Style 6 is a plain locked-corner box and is adapted for containers of small size and light weight of contents requiring rigidity.

Nearly all the common American woods are used in box construction. The industry employs short lengths from the mills and parts of the log which are not in wide demand for other purposes. The utilization of this lumber (which is an unavoidable byproduct to the manufacture of construction and factory lumber and which would in many cases otherwise be wasted) helps greatly to reduce sawmill overhead and to distribute more equally the cost of manufacture of all items produced from the log—in this way participating in the conservation and maximum utilization of the nation's forest resources.

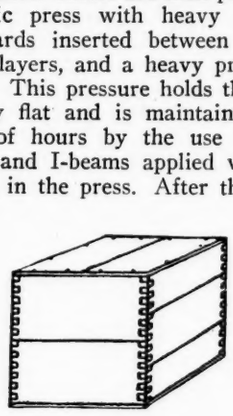
Some box lumber, such as mill ends, comes from the best parts of the log; much of it, however, as just indicated, is of the lower grades which contain numerous knots and defects. In manufacturing boxes from such lumber, large or loose knots and other defects which tend to weaken the box are cut out. Knots that interfere with proper nailing also should be eliminated. It is important that all box lumber be well seasoned. Boxes made of wet or unseasoned lumber and permitted to dry out subsequently in storage have less strength than those made of well-seasoned lumber in the first place.

A good box may fail in transit if improperly nailed together. Nails not only serve to hold the parts together but also provide rigidity. Too few nails or nails that are too small do not provide strength commensurate with that of the boards; likewise, nails that are too large may split the lumber and thus weaken the box. Proper nailing of boxes demands the correct number of nails of the right kind and size. The National Association of Wooden Box Manufacturers has worked out the following nailing schedule:

"Space nails holding boards to end grain of ends 1¾ inches apart, and space nails holding boards to side grain of ends 2 inches apart when nails are sixpenny or less. Increase spacing ¼ inch for each penny over 6. The nails that hold top and bottom to sides are governed by the same nailing rules, except that the nails should not be spaced closer than 6 to 8 inches because of the danger of splitting."

The size of the nail to be used is governed by the species of the wood and the thickness of the boards, consideration being given to the mechanical or strength properties of the wood and its tendency to split at the nails. Proper nailing schedules may be obtained from either the National Association of Wooden Box Manufacturers or the Forest Products Laboratory.

Besides the sawed and nailed wooden boxes there are plywood and wirebound boxes that come under the general category of wooden boxes. Plywood is a combination of two or more thin sheets of lumber glued together. It adds to the complications of the manufacture of wooden boxes. Thin sheets of veneer of a predetermined size are cut from logs on powerful laths. This veneer is then kiln dried in large kilns which operate continuously night and day. The material is next taken to the gluing room, where glue is spread upon the surface by a mechanical spreader. The glued veneer sheets are then placed in a hydraulic press with heavy three-ply oak boards inserted between each of several layers, and a heavy pressure is applied. This pressure holds the panels perfectly flat and is maintained for a period of hours by the use of turnbuckles and I-beams applied while the wood is in the press. After the panels

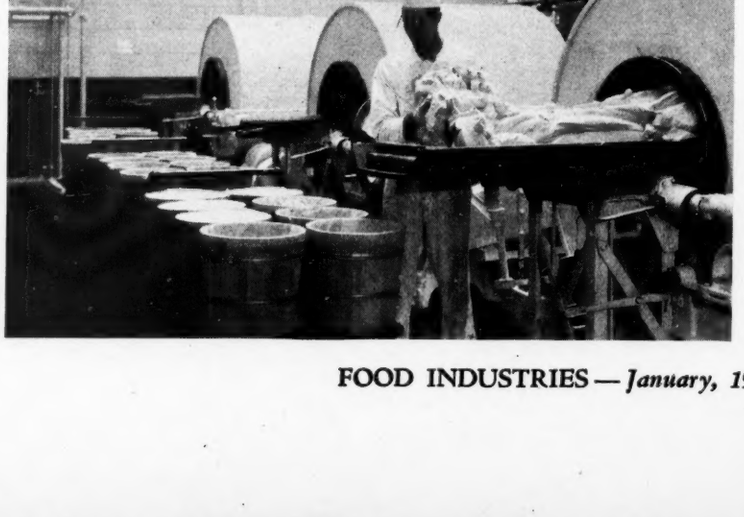


Style 6

are thoroughly dried, they are trimmed to the desired size and are either nailed by nailing machines or stapled by large staplers driving long metal staples through the veneer into the reinforcing cleats. The ends of the nails and staples are clinched. The cleats may be of hardwood, or softwood, depending upon the desire of the customer and purpose for which the boxes are to be used. Plywood may be made in a great variety of styles. Each box part is marked, indicating whether it be the end, side, top or bottom.

Wirebound boxes are made from thin sheets of lumber bound with two or more strands of wire and stapled or nailed to a framework of wood. In their knocked-down form, these boxes consist of the box-blank and the two ends. The box-blank comprises the consecutive faces, top, side, bottom, side, which are connected only by the binding wires.

Packing butter in wooden tubs lined with Kalamazoo vegetable parchment



Simplification of Consumer Food Packages

By W. E. BRAITHWAITE
Division of Simplified Practice,
U. S. Bureau of Standards

THE COST of distribution of commodities has in recent years played an increasingly important part in the selection of specific types of containers for use in packing and shipping. Food packing groups appreciate the inherent advantages for their industries in the adoption of a simplified list of sizes, capacities, and types of food containers. Some packers of food products have felt that they would lose their identity and possibly suffer some commercial disadvantage through a departure from odd types and sizes of packages. This attitude is gradually being changed, however, due to increasing knowledge of the economies of distribution. The producers and distributors of food products are finding that the simplification of dimensions and capacities of food packages is putting competition on a quality and service basis, where it belongs, which should eliminate a lot of wasteful competition resulting from fractional differences in sizes and net contents.

During the year 1929, a simplified practice recommendation was approved at a general conference of representatives of the preserving and glass-container industries, held under the auspices of the Division of Simplified Practice, which resulted in a reduction from 40 or more different sizes of preserve jars to 8 stock sizes; from 25 or more sizes of jelly glasses to 7; and from 6 sizes of apple butter jars to 4 stock sizes, all based on the avoirdupois weight of the food content. It is to be noted that this simplification program is confined to sizes and capacities, although the simplification of sizes based on net contents, did automatically eliminate a large number of odd and unnecessary shapes.

At a general conference held in Atlantic City, the bottlers of carbonated beverages, the manufacturers of bottles, bottling machinery, bottle caps, bottle boxes and crates approved a simplified list of stock bottles for use in bottling carbonated beverages. Definite capacities, heights, diameters, and weight of glass were approved for the bottles proposed as standard stock items. Minimum and maximum diameters were adopted for each capacity to allow for distinctive or patented shapes.

Another simplification program of interest to the food packing industries is that for ice cream brick molds and machine-filled cartons. At a general conference held in Washington on Dec. 4, 1929, and attended by representatives of manufacturers of ice cream, cartons, molds and filling machinery, a simplified list of dimensions was approved for the pint and quart machine-filled cartons and for the two-gallon ice cream brick mold. A survey made by the simplified practice committee of the International Association of Ice Cream Manufacturers developed the fact that 88 per cent of the ice cream manufacturers (based on gallonage produced) preferred two sizes of two-gallon molds. Of these two sizes, 51 per cent of the gallonage favored the 26x6¼x2⅞-inch mold, and 37 per cent preferred the 26 x6½x2¾-inch mold. It was the opinion of the conferees that one set of dimensions would be sufficient, and 26x6¼x 2⅞ inches was adopted by the conference, reducing the variety in sizes of molds from 30 to 1. The survey also developed the information that at least 31 different sets of dimensions were being used in manufacturing pint cartons. The same conditions obtained for the quart carton. The following dimensions were approved for adoption as standards: No. 1 U. S. standard machine-filled pint, 3⅞x3½x2⅛ inches; No. 2 U. S. standard machine-filled pint, 2⅞x3¼x3⅛ inches; No. 1 U. S. standard machine-filled quart, 2⅛ x 3½ x 6¼ inches, and No. 2 U. S. standard machine-filled quart, 2⅞x3⅛x7¾ inches.

In addition to the above examples of simplification programs which have already been developed by the industries concerned, and promulgated under the co-operative auspices of the Division of Simplified Practice, there are a number of food packing industries now considering the development of simplified practice recommendations for containers used in packing their products. For instance, a recent survey made by the Foodstuffs Division of the Bureau of Foreign and Domestic Commerce, at the request of the mayonnaise industry, showed that mayonnaise was being packed in 22 different sizes of containers. The survey further revealed the fact that over 85 per cent of the volume of production was being packed in 6 of these 22 containers. The glass container committee of the Mayonnaise Products Manufacturers' Association of America submitted a report and recommendation covering the subject of container standardization at the convention of mayonnaise manufacturers, held in Atlantic City in October.

Another container simplification project of considerable interest is that being developed for folding boxes for coffee. A preliminary study made by the Paperboard Industries Association showed that the 1-pound coffee container (folding box) is being produced in at least one hundred different sizes. This does not imply, of course, that there exists a variation in weight of the coffee sold over the counter. Two sizes only have been tentatively suggested for the consideration of coffee packers, paperboard box manufacturers, and the grocers. It is felt that two sizes would be ample to take care of differences in bulk. The simplification of sizes of folding boxes for coffee received favorable consideration at the recent New Orleans convention of the National Coffee Roasters' Association. A joint simplified practice committee representing both associations is now working on the preparation of a tentative recommendation for discussion and approval at a general conference of all those interested, to be held early in 1930 under the auspices of the Division of Simplified Practice.

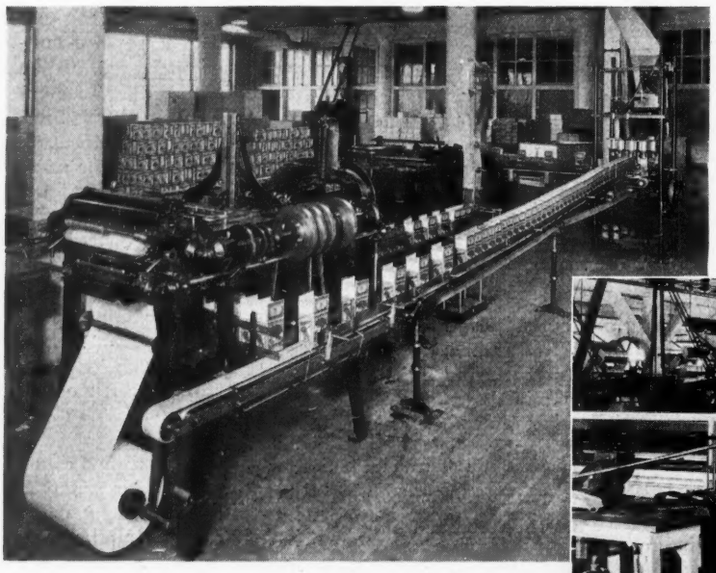
Perhaps the container simplification program of greatest interest to the manufacturers of food products is that for packers' cans. The Division of Simplified Practice, in co-operation with a committee of the National Canners' Association, has been working for some time past on such a project and it is expected that definite recommendations for fruit and vegetable cans will be ready for submittal to the forthcoming convention of the National Canners' Association.

The potential saving in national effort through such co-operation as referred to above and as demonstrated by many well-known examples of simplification and standardization is enormous. There is a great area still untouched, in which the application of waste-eliminating measures should save millions. The consequent reduction of manufacturing, selling, and distribution costs, and the release, for active use, of millions of dollars tied up in slow-moving stocks, should combine to yield savings eventually reaching the consumer.

As an evidence of the importance of simplification and standardization of packaging in the reduction of costs of distribution, it is interesting to note a recent announcement by the Associated Grocery Manufacturers of America. This association is undertaking a world-wide investigation to determine the means necessary to lower distribution costs in that industry. All factors entering into grocery distribution, such as packaging, bulk packing, shipping, warehousing, advertising, and selling, are being considered in this investigation. The matter of packaging can be the deciding factor between profit and loss per sale by the retailer and that point alone indicates the importance of this subject.

It will be seen, therefore, that interest in the package and container simplification movement is now far-reaching and that the co-operative service of the Division of Simplified Practice provides an excellent means whereby packers of food products, the manufacturers of containers, the grocery people and the shippers and carriers may develop and promulgate voluntary simplified practice recommendations for containers.

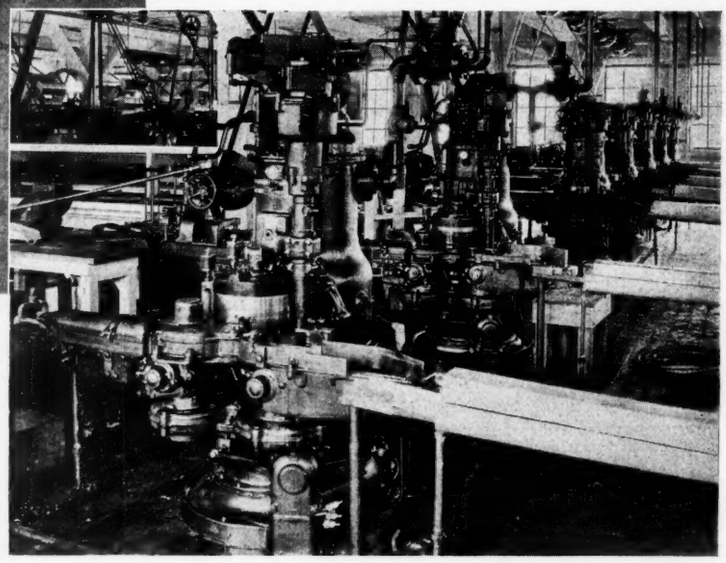
Modern Packaging Equipment

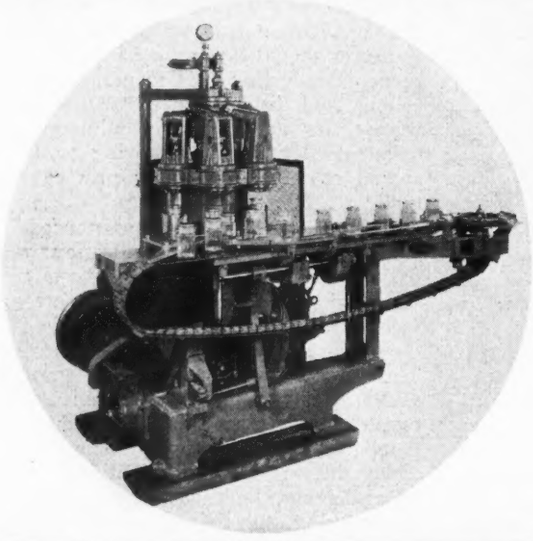


Left—Automatic coffee packaging at Fisher Brothers, Cleveland. This National Packaging Machinery Company unit makes up the liner, inserts, fills, weighs, and seals top and bottom

Below is a scene in a salmon cannery where seven automatic vacuum closing machines from the American Can Company put the lids on tin cans in a high vacuum

Pacific Fisherman Photo

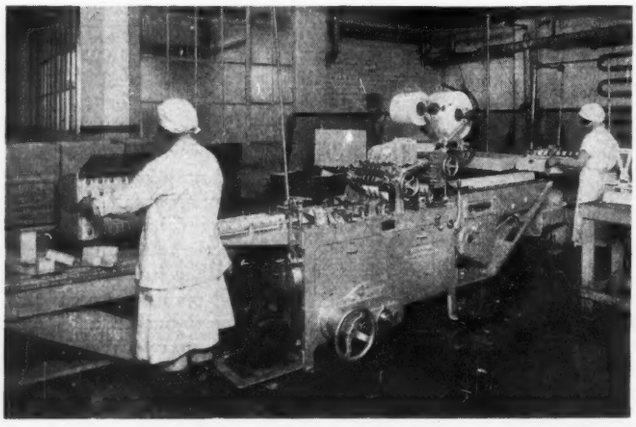


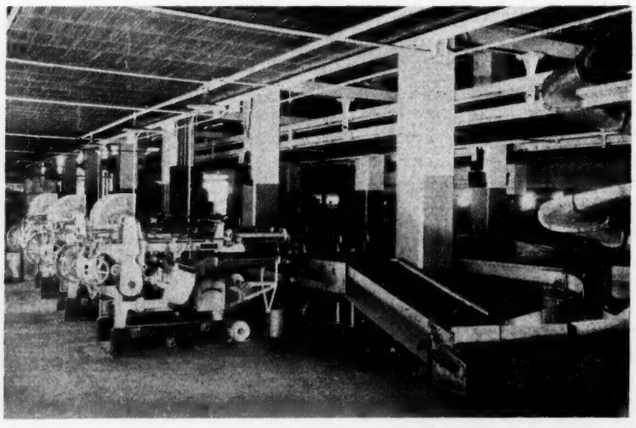


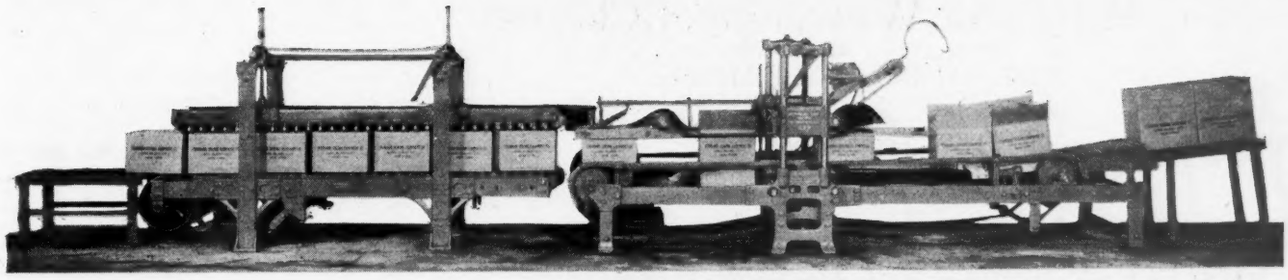
In the circle is an Anchor Cap rotary vacuum sealing machine. The use of vacuum, however, is optional with the user

Bottom left—Automatic wrapping of print butter at the Paige Dairy Company with equipment from the Automatic Molding & Folding Machine Company

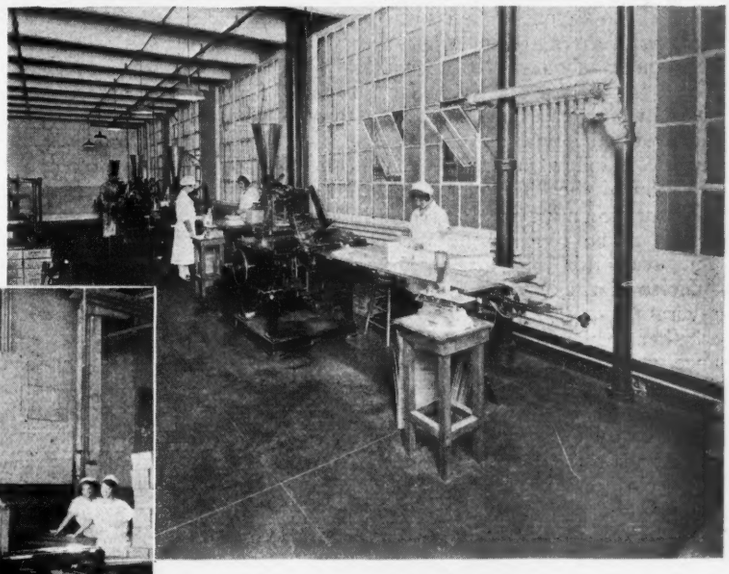
Bottom right—Freihofer Baking Company in Philadelphia uses these automatic wrappers made by the American Machine & Foundry Company





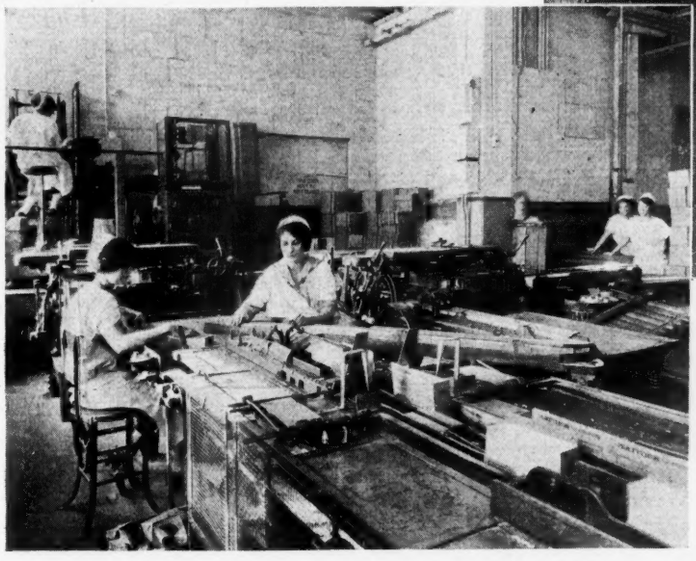


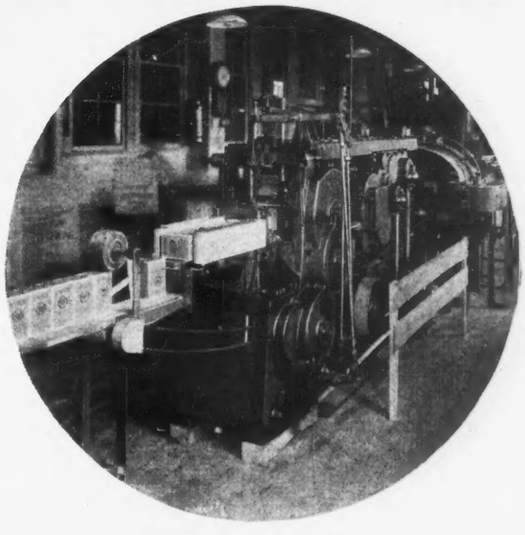
Above—Full-automatic case gluer with compression unit by Standard Equipment Company



Right—Lipton's tea balls are formed and filled in these Pneumatic Scale Company tea-ball machines

Below—Mueller's macaroni cartons are closed and wrapped in this Package Machinery Company line

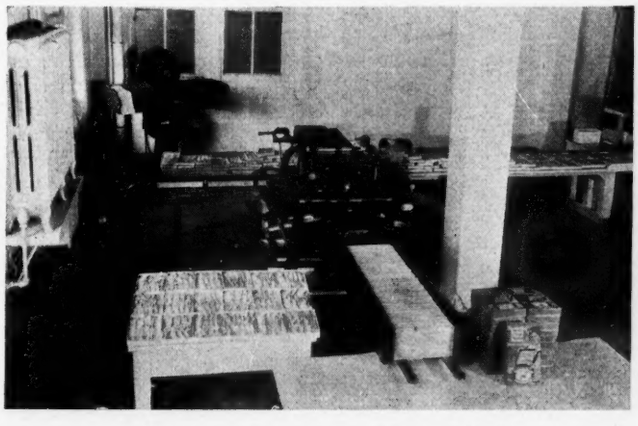




In the circle is a Stokes & Smith tight-wrapping machine on the coffee line of the Berdan Company, Toledo

Bottom left—Wrapping Beechnut bacon in Package Machinery Company equipment

Bottom right—Stitching filled cases of shredded wheat with a Morrison stitcher



The Why and Wherefore of Closures For Glass Containers

By S. Henry Ayers

Director Department of Industrial Food Processes, Pease Laboratories, Inc., New York City

"WHICH is the best closure?" is a question very frequently put to anyone engaged in research work with the glass container. Such a question is about as broad as asking which is the best airplane; for the answer in both cases must be based primarily on the type of performance required. It follows, therefore, that in the selection of the "best closure" the first consideration must be what type of product is to be retained by the closure. But even this information may give sufficient latitude for the inclusion of several types. So in the final analysis—whether decision be based on appearance, performance, cost, personal tastes, or any other factor large or small, such as salesmanship—we must find the answer for each particular application.

Perhaps there is no such thing as the "best closure," for, after all, any such decision must of necessity be influenced by personal opinions which may relate to relatively unimportant points. However, some types of closures are better for some products than others because they are constructed to function in different ways. The nature of the product frequently demands a certain type of closure. Consequently, we are led back to the primary consideration of performance. In order to determine if closures will meet the requirements demanded it is necessary to have complete knowledge of them and their method of application to the container.

In this article an attempt will be made to discuss closures, outlining the general principles governing their application and selection, and to consider in some detail a representative list of caps of various types employed for glass containers. While this list is ample to bring out the varied assortment, it can in no way be considered as a catalog.

In general, the purpose of the closure is to seal the container against outside influences which will cause deterioration of the product inclosed. As the products packed in glass are very extensive and of wide variety, a number of closures have been developed to meet the various needs of the industries. While one cap may be effective for certain products, it cannot be used as a universal closure.

Closures may be divided into three general types. The simplest is one which is designed primarily to exclude moisture from the product, and following in order are the airtight seal and the vacuum seal. Of course, the metal or glass closure alone cannot solve the problem, so that some type of material must be introduced between the glass and the cap to do this. Such materials are waxed paper, or pulpboard, composition or natural cork, oil paper or pulpboard. With the exception of cork, some form of pulpboard backing is necessary to give the proper cushioning effect between the liner and the container. The paper liners are not used for strictly airtight or vacuum seals, and, while with proper backing, they give the desired sealing effect for many products, at the same time they protect the products from coming in contact with the metal of the cap.

Gaskets used in caps are of vulcanized or composition rubber, while more recently cork rings have come into use. These gaskets do not cover the entire inner surface of the cap and are used purely for sealing purposes.

Fig. 1 illustrates several types of liners that are employed for use with a screw cap. These caps are ordinarily employed for medicinal preparations but are used for food products which do not require heating to high temperature as in pressure processing. The liners in all figures will be discussed from left to right. On the extreme left of Fig. 1 is shown a composition cork liner which may be used with any product that has no action on the cork or the binder which holds the ground cork together. In some instances the binder may be changed to meet the requirements of the user, but this is not always feasible nor possible. For this reason a protective liner is often imposed on the cork to prevent the action of the contents of the container, but more generally a pulpboard backing is employed. Wax paper is used when the product will not affect it, an oil paper for products such as mayonnaise, a special black paper to resist alkaline substances, and tinfoil where the product does not attack this metal.

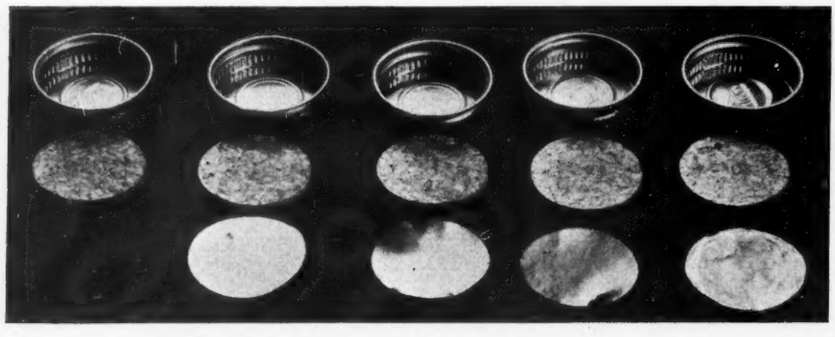


Fig. 1—Screw caps showing types of liners
Left to right: Composition-cork liner, composition cork and waxed paper, compostion cork with oiled paper, compostion cork with paper, composition with tinfoil-asphalt.

The caps of the type shown in Fig. 2 give a tight seal, but should not be used for products that require a high process temperature or a vacuum seal unless supplied with rubber gaskets. They can be employed for products which the consumer will keep in the original container and wish to reseal. The pulpboard and oil paper liner shown in the first cap would resist satisfactorily such products as pickles and olives without imparting any odor or flavor to the product. It must be borne in mind, however, that liners made by the various manufacturers differ to such an extent that no hard and fast rule can be laid down. For that reason any examples given of products that may be used with different liners are only of a general nature and should be accepted as such.

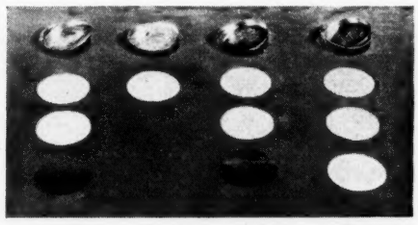


Fig. 2—Two-piece caps showing liners
Left to right: Pulp and oiled paper, waxed board, composition cork and oiled paper, composition cork and waxed paper.

The closures in Fig. 3, in addition to being hermetic seals, are capable of holding a high vacuum. The cap on the left is a special type of rubber-ring liner that finds application in the bottling of maraschino cherries. These cherries are also packed with a linseed-oil paper liner and cardboard backing. Composition rubber or a vulcanized rubber gasket is generally used when a high vacuum is desired and when the container is to be subjected to the high temperatures, such as in the processing of vegetables. The third cap in Fig. 3 is another type, to be described later in the paper. In this cap the metal on the inside is coated with an enamel that is resistent to the corrosive action of such products as tomato juice.

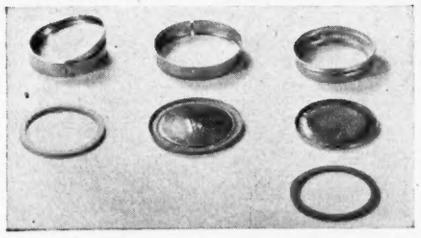


Fig. 3—Two-piece caps
Left to right: Rubber-ring seal, flowed-in composition rubber ring, rubber ring plus enameled disk.

There are only a few materials used for the construction of closures, for the metal must be easily worked and not subject to corrosion. It is probably only natural that tin plate would be easily fashioned into a closure for the glass container, since it had met with success in the tin can, particularly after the development of protective coatings. Certain types of closure are made almost entirely of this material, but in long storage under humid conditions the exterior of the cap may rust and become unattractive.

Aluminum is used as a complete cap but because of its malleability a counterbalanced air pressure must be used for food processed at high temperatures. In order to make a closure that would have the durability of the tin cap and some of the advantages of aluminum, a two-piece cap has been designed composed of a tin plate disk and an aluminum shell which is torn off by means of a tab, the tin disk is then pryed off. Looking at it from an appearance standpoint under adverse climatic conditions, the aluminum should retain its original condition longer than tin plate.

Glass closures are of two types, those which are held in place by iron clamps and those in which the cap is sealed either by a mechanical vacuum or the vacuum which develops as the product cools. The all glass container requires a heavy rubber ring as a liner.

Zinc has been used in recent years to a lesser extent than the other materials mentioned. Perhaps the most familiar example of such a closure is the screw cap used on the Mason jar so commonly employed in home canning.

Practically all metal caps are lacquered on both sides as a protection from rust or action of the product. In instances where no liner is employed, as in the side-seal or top-seal closures, employing only a rubber, composition rubber, or composition cork gasket, the lacquer serves as the protective coating for the closure. When no liner is used a special lacquer is generally employed. This procedure is important with substances that have a corrosive action on the metal, for once the plate is broken, the cap becomes badly rusted due to action on the exposed iron. In those cases where greater protection than can be furnished by vegetable lacquers is desired, an enamel is employed. Here also only general statements concerning protective coating are possible as different manufacturers employ different grades of lacquers as required by their trade.

The complete glass container consists of a bottle or jar shape, a finish at the top of the container, and a cap or stopper. By finish is meant the shape of the top which is necessary to permit the application of some form of cap. Any special finish can be applied to practically any shape bottle or jar, although in practice the application of certain closures is restricted to very definite uses and types of containers. Certain finishes permit the use of several different types of closures.

Standardization of the finishes for glass containers resulting from activities of the standardization committee of the Glass Container Association assures the packer of uniformity no matter where the container may be purchased. Likewise, the closures are manufactured to conform to this standard finish within definite allowances of standard practice.

In order to give the packer a general knowledge of various types of closures a series of sketches is presented in Fig. 4. These drawings show the detail of finish, liner, gasket, and cap, of several closures. This selection illustrates most of the general characteristics of closures, and will serve to show the major principles of sealing operations.

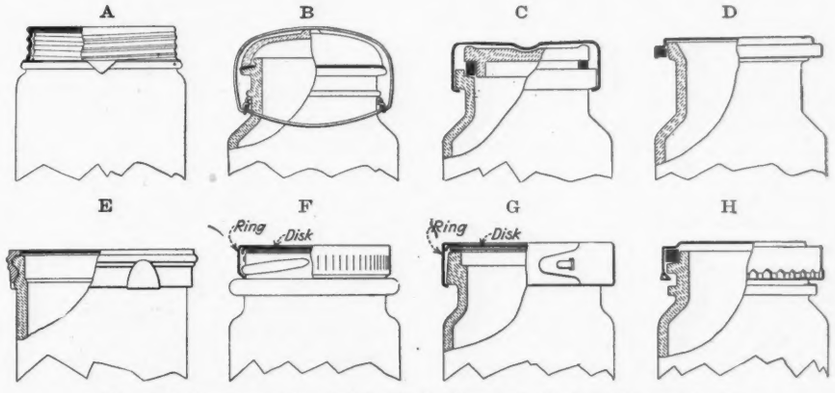


Fig. 4—Diagrammatic sketch illustrating principal sealing methods

In Fig. 4, sketch *A* shows the mason jar, certainly familiar to the majority of those whose mothers stocked their pantries with home-packed products. Here is a simple principle of a screw thread forcing the rim of the metal cap against the rubber ring just below the thread. The resilience of the rubber ring and the force with which the cap is turned down against the rubber gasket determines the tightness of the seal. If the contents of the container is hot the cooling action produces a partial vacuum within the container. The finish of this jar is a screw thread with a horizontal ridge or ring at the base of the threads to support the rubber. The actual seal occurs at the rubber ring.

Another method of sealing would be to have the rubber ring placed inside the cap against the glass disk so that when screwed in place the rubber would make contact with the top surface of the jar and the glass disk. This method, however, would afford no chance to break the seal by prying or pulling out the rubber. In this sketch is pictured a rubber ring with a tab which facilitates breaking the seal.

The glass-top jar pictured in sketch *B* also is a familiar container. In place of a screw thread, a wire clasp serves to force the top against the rubber ring. The clasp is in two sections—the wire which loops over the top, and the clamp to which this wire is attached. By forcing the clamp down the loop is pulled tight over the top. This sealing operation is generally performed while the contents are hot, thus obtaining a vacuum seal.

Another type of glass top is shown in sketch *C*. The finish has a sloping sealing edge inside the neck. The top is flat, with a circular ring on the bottom which holds the rubber ring or gasket in place. From the sketch it will be observed that this rubber gasket rests against the sloping finish. A spring clamp making contact at the top center of the cap and the ends hooking below the extension of the rim holds the cap in place. Internal pressure created by heating the container or reducing the external pressure in a vacuum chamber lifts the cap against the spring to permit the escape of air or liquid if the filling level is too high. When the internal pressure drops below the external pressure upon cooling or release of the external vacuum, the spring exerts sufficient force to effect a seal and prevent entrance of air. This valvelike action permits the escape of air but prevents its entrance.

The three closures mentioned represent fundamental principles of closure operation. In the first two, whether there be vacuum or not, the seal is effective provided the screw cap or wire clamp exerts sufficient force to maintain it. The third closure is strictly a vacuum seal. Unless there is a vacuum inside the container the cover is only lightly held in place by the clamp. When internal vacuum exists the top is firmly

held in place by atmospheric pressure. Releasing the vacuum releases the seal.

One type of metal closure which embodies unique methods of seal is shown in sketch *D*. This is a one-piece cap formed of lacquered metal. A heavy vulcanized rubber gasket is fitted into the skirt of the cap. The seal is effected by a mechanical crimping of the skirt to force the rubber gasket tight against the glass. The seal may be applied with or without a vacuum.

An entirely different type of cap is illustrated in sketch *E*. This cap is manufactured of lacquered aluminum sufficiently light weight to permit easy tearing. A rubber gasket is located inside the cap against the skirt. No mechanical action is required to effect the seal other than forcing the closure over the top of the jar. This cap is usually employed as a vacuum seal. Because of the light aluminum employed, the cap is bowed inward by the vacuum, tightening the seal. A special finish shown in the sketch is employed for this glass, although it may be used against a smooth surface.

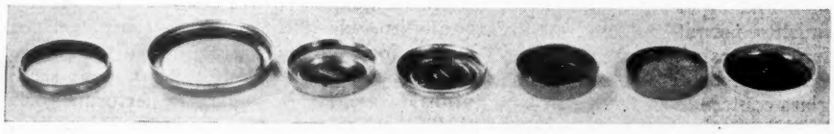


Fig. 5—Types of modern caps

Left to right: Atlas seal, two-piece continuous thread, band cap, snap cap, Aluminum Company rolled-on, Aluminum Company Goldy, White cap.

Sketch *F* illustrates the two-piece screw cap. A lug ring is shown, but a continuous thread (c.t.) finish may be employed if desired without changing the sealing efficiency in any way if applied under vacuum. A rubber gasket of the type required for the product is secured to the lower side of the disk. Screwing the ring in place forces the disk against the glass. In vacuum practice the disk is forced in place by head pressure on the disk after the vacuum has been applied to the chamber. This head pressure is maintained until the chamber vacuum has been released. The outer ring serves to protect the disk and gasket from any force which might break the seal.

Another two-piece cap employs a band with a clip to permit easy removal of the band. Sketch *G* shows this type of cap. The gasket or liner is secured to the disk. The band is a separate piece. This closure can be applied to a hot package or under a vacuum. Rollers turn the lower edge of the band under the finish, thus securely fixing it in position.

The crown type of closure extensively used on beverage bottles and other narrow-mouth containers, is well known. The standard crown has a composition or natural cork liner which seals against the top surface. However, large sized crowns with other materials as liners or gaskets are now available. Head pressure forces the liner against the glass and a throat passing down over the cap forces the skirt in around the finish giving a mechanical seal. This closure is capable of holding considerable internal pressure.

A modification of the crown, utilizing the crown mechanical seal, but possessing a gasket which is forced into a right angle ledge on the outside of the neck is shown in sketch *H*. The gasket is forced against the horizontal and vertical surface and the skirt which is somewhat longer than on the standard crown is forced around the ring. A vacuum or non-vacuum seal may be employed.

No doubt the simplest closure, both in construction and method of application, is the stopper. A slight pressure forces it into the bottle and the seal is made. While many of the metal caps may appear complicated, their application is no more involved than sealing with a stopper. A head pressure applied by a cup-shaped head with a suitable guide effects the seal. The crown is one instance. Other closures require less mechanical operation than the crown; that is, there is no change in the shape of the cap. Such a seal is shown in sketch *E* of Fig. 4.

Even when the sealing operation is simple, some type of sealing machine generally is employed. Hand-operated types are available for many of the closures. Others require power-driven machines of varying sizes and complexity, depending upon the type of closure and capacity required. Single-head non-vacuum or multiple-head vacuum-sealing machines capable of high speed can be obtained to meet the packers requirements.

There is a distinct difference in closures for cold packs vacuum sealed, for products packed hot or pasteurized at relatively low temperatures, and for products packed at high temperatures. This is especially true of the liner. Many failures of closures used on processed goods can be traced to an improper liner or gasket.

One of the essential differences in caps is the extent to which air pressure is required during processing to prevent the seal being forced off or the buckling of the metal. For those like the crown cap in the smaller sizes, no additional air pressure is required, provided no excessive internal pressure is created during the process. On the larger sizes a vacuum may be employed to reduce the internal pressure, and may permit processing without additional pressure. For at least one type of closure (Fig. 4, sketch *C*), air pressure is required only during cooling, although it may be employed during the entire cook if the container has been vacuum-sealed or packed hot. Additional air pressure is required with closures such as shown in sketches *D*, *E*, and *F* of Fig. 4. The proper functioning of these closures depends upon control of this pressure.

Distinct methods of processing have been developed for use with these caps, and perfect results may not be obtained unless such methods are employed. The use of air pressure does not involve very complicated apparatus and automatic control assures the proper pressure throughout the cook.

In Figs. 5, 6, 7, 8 and 9 are illustrated a number of the various closures available for use with food products. The illustrations have been selected to afford the packer an opportunity to view the various closures available for his use, but the list is by no means complete.

The first group of caps shown in Fig. 5 are manufactured by the Hazel-Atlas Glass Company, the Phoenix-Hermetic Company, the Aluminum Company of America, and the White Cap Company. The Hazel-Atlas cap is a light aluminum lacquered cap for vacuum sealing. This is a tear-off cap with two tabs. The other is a two-piece c.t. cap with a special flowed-in composition made by the Dewey & Almy Company. The Phoenix-Hermetic closures are the well-known band-cap type, and a snap cap. The clasp on the band cap opens easily, releasing the band. This also has a flowed-in composition made by the Phoenix-Hermetic Company. The snap cap is used for vacuum sealing. The r.o. (roll on) type of the Aluminum Company of America is one in which the cap is placed on the jar and the thread rolled into the thread on the bottle. The Goldy cap, the second of the Aluminum Company, is a two-piece cap with a tab which permits the ring to be separated by tearing down. The cap manufactured by the White Cap Company is made in one piece with a composition rubber ring in the skirt. It is a vacuum seal.

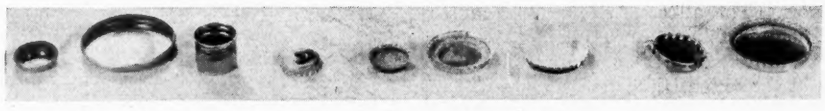


Fig. 6—Caps and liners

Left to right: Anchor, Paragon and "Handy" caps, crown cap with cork disk, crown cap with cork ring, milk closure with paper liner, Williams cap, Closure Service cap.

The second group, Fig. 7, shows caps manufactured by the Anchor Cap &

Closure Corporation, Apex Stamping Company, Bond Manufacturing Company, Crown Cork & Seal Company, Williams Sealing Corporation, and Closure Service Company. The Paragon cap, shown third from the left, is a cover cap intended to serve as a closure after the smaller cap which formed the original seal has been removed. This type of cap is generally found on catsup bottles. The Apex Stamping Company closure is a crown with a tear-off tab to facilitate removal. Two crowns, one with a composition cork disk and the other with a paper liner for milk bottles, represent caps of the Crown Cork & Seal Company, which also makes a cap with a composition gasket. A crown with a composition cork ring used for chocolate milk manufactured by the Bond Manufacturing Company is another type of crown available. The binder used in this composition cork is a synthetic resin, which will withstand higher process temperatures than the binders in some other composition cork. A Williams cap, with a wire below the finish tightened by pressing down the twisted-wire lever, has an entirely different principle of effecting the seal, and has a reseal feature. This

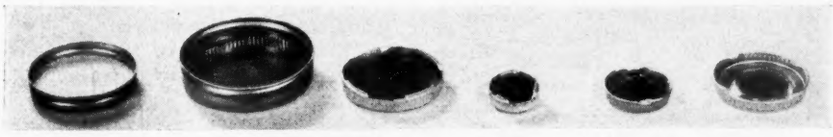


Fig. 7—Continuous thread and lug caps
Left to right: One-piece c.t. with varnished-paper liner, with waxed-paper liner, Duplex 4-lug, Duplex 3-lug, Amerseal 2-lug, Amerseal 4-lug.

cap is manufactured in relatively small sizes for narrow mouth containers. The Closure Service supercrown with the modified top-side seal represents another type of crown closure.

The screw principle is utilized by the closures pictured in Fig. 7. C. T. (continuous thread) caps are manufactured by a number of companies to fit standard finishes. In the illustration one-piece caps are shown, but two-piece caps are generally used, especially on the larger sizes. The National Seal Company manufactures the Duplex Cap. This cap has wide metal grips on the bottom of the skirt which engage a lug parallel to the top finish. The pitch of the metal grips pulls the cap down with a quarter turn of the cap. Indentations on the metal grip prevent the cap being turned beyond the proper position for a maximum seal. This cap can be used as a reseal.

Another type of quarter turn screw cap is the Amerseal, made by the American Metal Cap Company. A divided thread finish is employed for this closure. Two or four lugs on the cap, depending upon the size, engage the thread and a slight turn secures the cap. The cap can be applied with or without vacuum and has reseal features.

Glass jars using one-piece metal or glass caps with special rubber rings are grouped in Fig. 8. Three of these have already been discussed under Fig. 4. These are manufactured by Ball Brothers, and Hazel-Atlas Glass Company. The vacuum-seal jar is handled by the Vacuum Seal Company. The fourth exhibit is also a Hazel-Atlas container using two wire clamps which fit into depressions in the cap and below the ring finish on the neck.

In Fig. 9 is a miscellaneous group more or less familiar to everyone. First is the old reliable cork stopper which may not enjoy the same popularity as of former days, although sales records might afford some revelations, and it is still an important closure. A modification, possibly not extensively used as a food container closure, is the cork stopper plus a bakelite or wooden cap, manufactured by the Armstrong Cap Company. The glass stopper with a natural cork sleeve is another variation of the stopper. Still another advance is the stopper made of bakelite, glass, or porcelain, to engage a thread formed inside the neck of the bottle. A rubber stopper is still available.

Possibly the most common type of closure is the pasteboard cap used to seal milk bottles. This is so familiar to everyone that no illustration is given. It is usually nothing more than a pasteboard disk fitting snugly just below the inside top of the bottle. Some of them have a small paper tab or a tiny wire hook to facilitate removal. As a precautionary measure some of the better grades of milk have a pasteboard hood fitted over the entire top of the bottle and held tight by a notched wire ring around the neck of the bottle. Another development in protective caps is one made of multiple-ply paper molded by means of heat and pressure to fit over each milk bottle.

Fig. 10 illustrates examples of decorative caps. While the majority of caps are the natural lacquered metal color, it is possible to achieve very pleasing effects by using solid colors, or stencil effects combining colors with the regular metal shade. The nickel-plated embossed screw cap may have limited

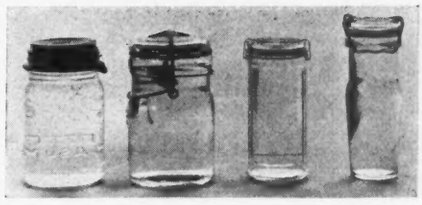


Fig. 8—Mason jar, lightning jar, vacuum seal, and Hazel-Atlas jar

use for food containers, but it represents a form of decoration which has extensive possibilities.

The second example in Fig. 10 is an attractively decorated cap illustrating the possibilities in the use of color lithography. Here is an appealing decorative effect based on the well known willow ware pattern.

The use of one additional color with crown caps has been found successful in the case of milk bottle closures. The lithographing serves to inform the public as to the name of the manufacturer, date of pasteurization, grade of milk, or similar selling features.

In general, the use of decorative caps permits the manufacturer to appeal to the artistic tastes of the consumer by many color combinations or embossed effects. This appeal is a very strong selling point and serves to add distinction to a product. In addition to dressing up the package by decorated caps, either plain colored caps or artistic designs, the product, concern, or trademark, if permanently fixed to a cap which is of the reseal variety, serves as a constant reminder of the original purchase.

One question of extreme importance to the housewife is how to remove the cap. Printed instructions are no doubt of some value, but they are often neglected or some essential point is omitted. For the purpose of instruction a brief discussion of methods of removing caps is included in this article.

There is a type of cap which should be removed by some form of hook opener. The Crown and Anchor caps are examples of this type. When using the hook opener on a large sized closure it is advantageous to start at one position with a lift sufficient to start the cap then lifting at several other points around the top. This will accomplish the removal without bending the cap and with much more ease. With the small-sized crown a single pull will dislodge the cap.

One improvement is the pry-off finish which permits the use of a coin or knife

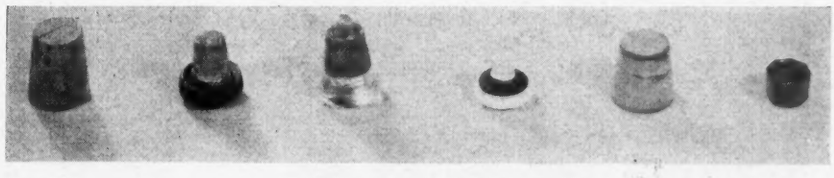


Fig. 9—Special closures
Left to right: Cork, cork with Bakelite top, glass with cork sleeve, porcelain with rubber sleeve, rubber stopper, Bakelite screw-thread cap.

to pry up the cap using the glass ring as the fulcrum. If the seal is tight it may be necessary to pry up the cap at several positions before the grip is broken.

Several types of tear-off caps are manufactured. These caps are easily removed provided the tearing is started in the proper direction. Tearing out of the metal before the grip is released generally results from a crooked tear. A very light aluminum is used for such caps, and this can be easily cut if the tab breaks away before the tear-off action is completed. When heavier tin plate is used a score on the metal aids the tear.

With two-pieced caps, such as the band, c.t. screw, or Goldy, the ring is easily removed from the band by opening the clasp, or on the Goldy by pulling down on the tab. The inner disk held on by vacuum, can then be removed by inserting the point of a knife between the gasket and the glass, releasing the vacuum. If this cannot be accomplished, puncturing the disk to release the vacuum and prying off will work.

Screw caps should be fairly easy to remove, but too often the closing machine setting or the desire of the packer to prevent any chance of cap failure result in an extremely tight closure difficult to turn by hand. In this case tapping around the top edge or pressure applied on the top around the edge will loosen the cap.

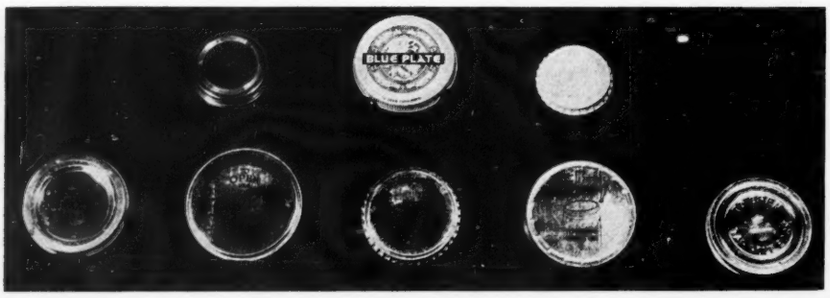
Excellent closures are available for sealing the glass container. They have been constantly improved and changed to meet the various requirements they are called upon to fulfill.

Choice of a type of closure should be governed primarily by the performance required by the product. When the type has been determined, selection of the particular style within the group may be governed by other considerations.

For products where a liner is required in the metal cap, too much consideration cannot be given to the choice of the material to be used. Failure of intelligent selection of the liner may result in spoilage of the enclosed product.

If the "best closure" can be named, it is the one which gives the best performance for the purpose selected and at the same time meets with the most hearty approval of the purchaser of the container on which it rests.

Fig. 10—Decorative and "printed- instruction" caps



The Mechanics of Labeling

By G. T. JAHNKE
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WITH the advent of packaged foods, a label, to designate kind and quality, became necessary. As competition in packaged foods became more keen, progressive manufacturers found that the label could do more than designate kind and quality. It could have a psychological influence on the purchase of the product. To make a really appealing package it was necessary that these labels be affixed to the package in a neat manner and in the same position on each container, so that they would present an attractive

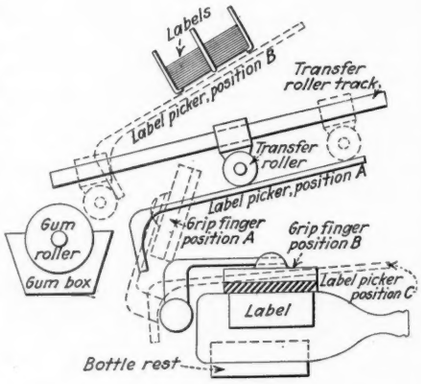


Fig. 1—The transfer roller picks up gum from the gum roller and applies it to the label picker while in position A. The picker then raises to position B and picks a label from the holder, placing the label on the bottle by moving to position C

appearance on dealers' shelves collectively as well as individually. Thus, manufacturers were confronted with the problem of not only applying labels but applying them attractively. Naturally, as in any other manufacturing problem, speed of production also entered into the picture and machines soon supplanted slow and costly hand methods, except in rare cases where quantities were extremely small.

Labeling of canned foods in round tin containers is done on a gravity type machine with which most food manufacturers are familiar. The labels are

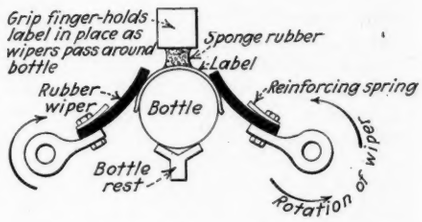


Fig. 2—This shows the wipers and grip finger used for round bottles

gummed; the cans roll down an incline, and each picks up its own label, which is affixed to the can simply by its own weight. Such a machine served the purpose very well for products in round tin containers, but when the container assumed a different shape and a different material, such as glass, it could not be rolled on its side. A semi-automatic or hand-fed machine was then developed and is used in a great many plants today where production does not warrant the use of fully automatic machines.

These hand-fed or semi-automatic labelers are similar in operation to the diagram shown in Fig. 1, in which a large brass roller revolves in a trough partially filled with gum or glue. A transfer roller, usually of rubber, slides up and down on a track and makes contact with the upper circumference of the gummed roller, picking up just enough gum to affix a label. This transfer roller then transfers the gum to a device known as a label picker, which picks a label from a label-holder box by placing

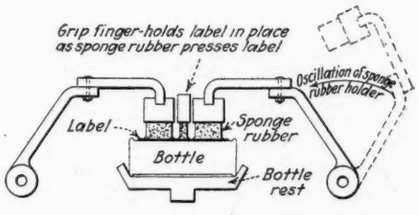


Fig. 3—Flat and panel bottles call for this type of press wiper

its gummed surface against the lower label, which adheres to the picker.

The picker finger then moves down and places this label on the bottle. A grip finger, also shown in the illustration, then moves down to hold the label on the bottle while the label picker returns for its next label. As this happens a set of rubber wipers securely affixes the label to the bottle. These wipers are shown in Fig. 2.

The speed of such a machine is between 30 and 40 containers per minute, depending upon the speed of the operator. As many as three labels may be affixed to each container in one

operation (a body label, a neck label and foil). Where flat or paneled bottles or containers are to be labeled, the wipers differ, being made of sponge rubber and operating about as shown in Fig. 3.

Where it is necessary to label a greater hourly production than can be handled on one of these hand-fed machines, a fully automatic labeler will be found more economical in operation than two or more hand-fed machines. The automatic machine requires only one operator and can label from 60 to 120 containers per minute.

One type of automatic labeler operates on the rotary principle, bottles being fed into the machine by means of a conveyor chain and feed turret as shown

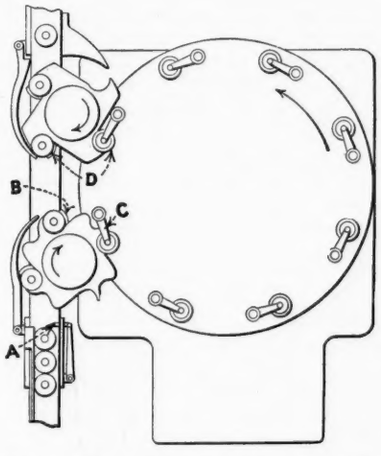


Fig. 4—The containers are under positive control throughout the labeling operation. At A, a timing latch hold the bottles back in the conveyor until the feed turret is in proper position to receive them. At B, grip fingers hold them firmly in the feed turret. As they start around the turntable at C, a grip comes down on the top of the bottle and holds them during the labeling process. At D, positive grips hold them in the discharge turret until delivered to the accumulating table

in Fig. 4. The affixing of the labels to the bottles is accomplished in much the same manner as described above for hand-fed machines except that the bottles are in a vertical instead of horizontal position. Instead of using rubber wipers, as described in the hand-operated machines, these machines use a series of brushes as shown in Fig. 5.

Machines which label at as great a speed as the one described necessarily require that the containers be under perfect control at all times. This is accomplished by a series of grips, which firmly hold the containers during all of the operations. One set of these grips is in the feed turret, another is on the table itself. They come down on the top of a container, pressing it firmly down against the turntable, so that there is no possibility of the container toppling over as it passes through the machine (see Fig. 6).

For a capacity greater than 80 to 120 or even 130 bottles per minute, one type machine employs two label affixing mechanisms and one turntable. By this means the actual speed of this machine is only a very little greater than the machines having only one label-affixing device. The actual application of the label is made at even a slower speed than on the single machine.

Suitable devices are provided for affixing foil, such as is used on some types of ginger ale bottles. The foiling is done at the same time that the body and neck labels are affixed, decreasing the speed of labeling only very slightly.

It is often desirable to label jugs and cans in such a manner that the labels on all containers will be in the same position with respect to the jug handle or the bale on a can. Containers labeled in this way present a more attractive appearance on dealers' shelves. One of the machines described above has been adapted by the manufacturer to handle this problem. It is provided with a mechanism at the feed turret which automatically aligns the cans so that the labels will be placed in the proper position on each can or jug.

Editorial Opportunity

We are asking our readers to help us locate a man for technical editorial work. We think he may be found in some baking, meat packing, milling, dairy or other food establishment. In the 5 or 10 years since he was graduated from a course in mechanical or chemical engineering he probably has held two or three jobs in food manufacture and made good in all of them. There is something about his ability to think in straight lines that causes his superiors to ask his opinions about important matters because he spots the weakness in a proposal with surprising accuracy for one so young.

We think that he is now employed as a superintendent, assistant factory manager or in the development or research department, for he is factory-minded. Perhaps he is in the consulting business. Things seldom go wrong in his place because he is very alert and foresees trouble before it comes. When called upon for a report it is accurate, simple, direct. His recommendations are based on logic and supported by the necessary documents and evidence, for he is thorough. He loves a difficult job.

We believe that in editorial work he can develop into broader usefulness. If you know of such a man please send us his name and qualifications, or, better yet, ask him to write direct to H. C. Parmelee, editor, FOOD INDUSTRIES, telling about himself, his training and experience.

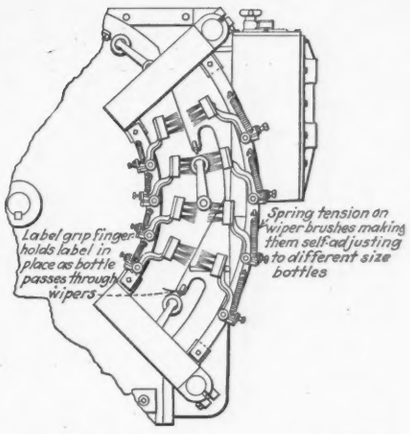

Label grip finger holds label in place as bottle passes through wipers
Spring tension on wiper brushes making them self-adjusting to different size bottles

Fig. 5—The container passes through four pairs of wipers to insure smooth and firmly affixed labels

It has been demonstrated that for high-speed labeling the rotary principle machine is more satisfactory because of the absence of jerky oscillating motions. The oscillating-type machines vibrate considerably, which has a tendency to loosen parts and cause more rapid wear than is the case where the continuous rotary motion is employed. Special machines also are built which affix two body labels to a container, one on each side.

It might be interesting to compare costs of hand-labeling with the semi-automatic or hand-fed machine method. Such a comparison was recently made in one plant where containers of all sizes from 6-ounce bottles to quart mason jars are labeled with one body label. It was found that the cost per dozen bottles labeled by hand was \$0.0072, while the cost per dozen bottles labeled with hand-fed machines was \$0.0024; a cost reduction of 67 per cent,

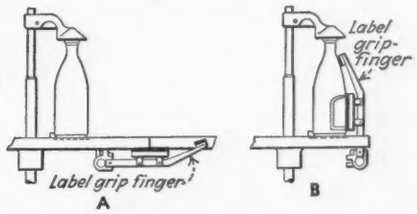


Fig. 6—View A shows the label grip finger before the label has been placed on the bottle by the label pickers. View B shows the finger holding the label in place as the bottle passes through the wipers

which in the case of the manufacturer in question meant an actual saving per machine of over \$2,300 per year as compared with the hand-labeling methods.

Actual figures on fully automatic labeling as compared with semi-automatic labeling are not available, but would show an even greater increase in efficiency than is apparent between semi-automatic and hand-operations.

ABSTRACTS · OF · CURRENT · LITERATURE

CASHEW NUT PRODUCTS. Charles W. Rivise. *Plastics 5,* 680-1; December, 1929. The cashew nut is used as a substitute for almonds and for coloring oils and fats. The acid juice of the pericarp, known as cashew-nut shell oil, has been a waste product in the exploitation of the edible part of the nut. The amounts utilized (in medicine and as an ant repellent) have not been commercially significant. A recent discovery, made and patented by M. T. Harvey, shows promise of changing this and bringing the byproduct oil into more prominence as a useful part of the cashew nut. Harvey has found that the oil, by suitable heat and oxidation treatments, can be converted into a drying oil or into resinous plastic materials. A review is given of his patents, which specify numerous compositions of the treated oil for use in coatings, plastic materials and the like.

* * *

DISCOLORATION OF CHEESE. Walter V. Price. *Journal of Dairy Science 12,* 377-8; September, 1929. A case is reported in which a color defect was observed in a brand of process cheese. Though it had no perceptible effect on quality, the color caused rejection of the cheese by buyers. It was a darkening, to about the tint of thymol blue in the pH range from 2 to 2.4, but not identical with the tint produced by simple high-temperature darkening of the cheese. By laboratory and factory trials, the defective color was finally traced to accumulations of cheese from preceding batches being worked into new batches. If these accumulations were left while the processing kettle remained idle an hour or two—e.g., through the noon hour—subsequent batches usually were discolored. Care to prevent contamination of new batches from old eliminated the defect.

* * *

COCOA BUTTER. J. D. van Roon. *Chemisch Weekblad 26,* 576-7; Nov. 23, 1929. The differences of opinion which have arisen about the validity of the ultra-violet light (fluorescence) test for cocoa butter are studied. The cause of the confusion is considered to be the fact, hitherto overlooked, that the fluorescence behavior of raw and refined cocoa butter depends on its age as well as on whether or not it has been refined. In the fresh product, if examined by transmitted as well as by reflected light, a fairly reliable distinction can be drawn between raw and refined cocoa butter. But as it ages, the untreated fat begins to acquire fluorescent properties like that which has been decolorized with an adsorbent. The relations involved in fluorescence behavior are so complex that the ultra-violet light test is considered to be unsuitable for the purpose. It is particularly unreliable as a means of detecting raw cocoa butter admixed with the refined fat. Experiments indicate that the fluorescence is an inherent property of the fat, belonging to one or more of the glycerides naturally present. The reason the raw fat is non-fluorescent is that the fluorescence is masked by impurities, which are removed by treatment with fullers earth or decolorizing carbon.

* * *

PRESERVING FRUIT JUICES. V. R. Kokatnur. *Fruit Products Journal 9,* No. 1, 16-7; September, 1929. The Kokatnur patent (U. S. P. 1,715,932, June 4, 1929) is considered to be the first rational attempt at a practical commercial utilization of the known fact that the skins of many fruits (especially citrus fruits) contain substances which act as preservatives in the juice. The method of taking advantage of this natural preservative is to extract, with water or juice, the skins of about 10 to 15 per cent of the fruit from which the juice is taken, and to pasteurize the juice with the added preservative extract. De-aeration by vacuum is helpful, but not necessary. The new process is the cheapest preservative treatment, in that it requires no equipment or machinery that is not already used in fruit-juice manufacture. The major application is in orange-juice manufacture, but the other citrus fruits and also pineapples, apples and the like also can be treated in the same way.

* * *

CITRUS FRUIT ESSENCES. Giovanni Romeo. *Rivista italiana delle essenze e profumi 11,* 272-3; October, 1929. The concentrated essence industry is now in the stage of development in which there is active competition between those who devise new ways of detecting adulteration and those who seek adulterants which cannot be detected. Owing to the high content of oxygen compounds in the concentrated citrus fruit essences, detection of adulteration is comparatively easy; yet fraudulent additions are more or less frequent. For concentrated lemon essence, the favorite adulterants are citral, lemongrass oil, linalyl acetate and geranyl acetate; in orange essence, citral and terpineol are used; in bergamot essence the usual adulterant is synthetic linalyl acetate, not the acetins of compounds naturally occurring in the oil. Published information about citrus fruit essences (concentrated) is scanty, and confined almost entirely to lemon and orange essences. Therefore, for the guidance of users of these essences, data are presented on the physical and optical properties and solubilities of the following concentrated essences: terpene-free lemon, sesquiterpene-free lemon, sweet orange, bitter orange, mandarin and bergamot. More allowance for deviations should be made for lemon essence than for the others, because it is more commonly made from machine-extracted lemon oil.

* * *

TASTE OF MILK. C. L. Roadhouse and G. A. Koestler. *Journal of Dairy Science 12,* 421-37; November, 1929. For precision, taste and flavor of milk are differentiated; taste refers to mouth sensations only, while flavor includes sensations of both the mouth and the inner nasal passages. Proceeding on this basis, observations led to the conclusion that the chloride-lactose ratio is a leading factor in taste; with a high ratio the grading is less favorable than with a low chloride-lactose ratio. By dialysis, milk can be separated into two parts which differ in taste; the dialyzate contains nearly all the primary taste components, the residue being nearly tasteless. Dialysis also reveals that fat, protein and the difficulty dialyzable salts in milk have only a minor influence on taste. Secondary tastes may be introduced into milk by outside influences, such as consumption of certain feeds by the cows. When milk having a feed taste is dialyzed, the feed taste remains in the residue while the primary tastes go into the dialyzate. Secondary flavors, often volatile or aromatic, also occur in milk. Some secondary flavor sensations concentrate in the mucous membranes and cause an aftertaste, whereas the primary milk taste does not leave an after-sensation. A particularly low grading is given to milk which has a flat, watery taste. In its practical aspects, as a factor in the public use of milk, it is believed that there is closer agreement in consumer ideas of desirable milk taste than there is in the case of butter and cheese.

* * *

SUGAR BOILING. F. Saldana-Davila. *Sugar 31,* 405-9; November, 1929. Purity is not the only criterion of the boiling behavior and yield of a sugar; differences in purity which affect yield can be easily detected by polarimetric or specific gravity measurements, but colloidal conditions having fully as much effect on yield are much more difficult to detect. These colloidal conditions also introduce much difficulty in boiler house procedure. Suspended matter is derived from unclean cane or cane grown in undesirable soils, or from faulty screening and clarification of sugar liquors. Given a sugar liquor of known purity and quality, the forming and building up of the massecuite depend on proper manipulation of the conditions of temperature, vacuum, steam supply and rate of feed of the liquor. A great deal depends on the skill of the operator.

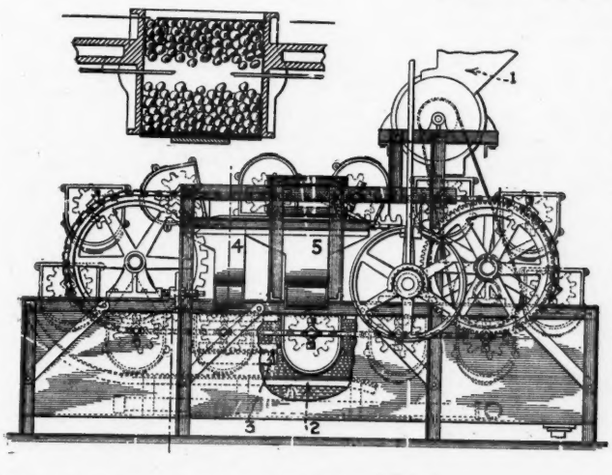
· SELECTED · PATENTS ·

Keeping Dairy Products Fresh — Samuel B. Chambers, Chicago, Ill. No. 1,735,313. Nov. 15, 1929—The freshness of dairy products is said to be preserved over a long period by treatment with malt diastase. In the treatment of butter, which, it is claimed, will remain sweet for weeks at 70° F. following the treatment, diastase of 150° Linter is added to the cream before pasteurization, 1½ lb. of diastase for each 100 lb. of cream. The temperature is maintained at about 130° F. for two hours after mixing, and at the end of this period is raised to 150° for five minutes to stop the action of the diastase. Further pasteurization is unnecessary, and the churning operation is then carried out as usual. It is claimed that no change in taste, either of butter or milk, is caused by the treatment with diastase.

* * *

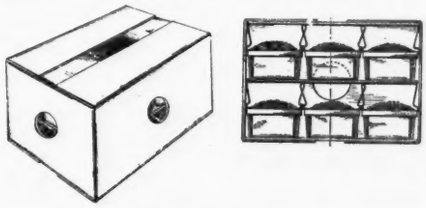
Automatic Grader for Peas—Clarence H. Plummer, Kewaunee, Wis. No. 1,735,089. Nov. 12, 1929—Fancy grade peas are separated from the more mature grades, and from foreign vegetative growths such as thistle buds, by means of differences in specific gravity. Objectionable features of former specific gravity methods, such as eddy currents in the liquid medium, absorption of salt by the peas, and lack of sufficient variation in specific gravity between young and mature peas, are said to be eliminated. When used on such varieties as "sweet peas," the apparatus makes use of the fact that the younger peas, when subjected to heat while in the separating medium, are rendered buoyant by expansion of occluded gases, while the more mature peas, having more developed starch grains and therefore less occluded gas, are less affected by the heat. A material difference in specific gravity is thus temporarily created. The apparatus, as shown in the illustration, consists of a number of buckets moving on an endless chain. The peas enter the buckets in measured quantities from the hopper (1) and pass into the saline solution as the belt moves clockwise. (The solution may be slightly heated to accentuate specific gravity difference.) The buckets contain perforations on the bottom through which the solution enters. The buckets are filled by the time they reach the track member (2), and here auxiliary bottoms close the perforations. The floating peas gradually locate in upper or lower levels, and a cam (3) causes two blades to enter the buckets and divide them, as shown in the smaller figure. The perforations are again opened as the buckets come out of solution, allowing them to drain. The top layer of tender peas are automatically emptied into the chute (4) as the bucket is tipped, and, as the bucket moves over chute (5), the dividing blades are drawn back and the remaining peas are emptied.

Automatic Pea Grader



* * *

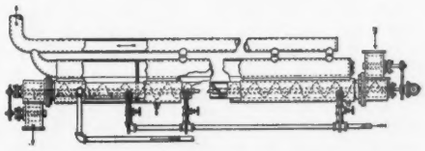
Cardboard Crate for Fruit — George K. S. Ferguson, North East, Pa. No. 1,732,264. Oct. 22, 1929—In order to provide ventilation for fresh fruits when packed in crates which are to be stored side by side, centrally located openings are cut in the cardboard cartons as shown in illustration. When the cartons



are stacked, the adjacent openings provide a continuous horizontal ventilating passage. General construction is shown in the right-hand figure.

* * *

Apparatus for Cooling and Treating Raisins and Similar Fruits—Thomas W. W. Forrest, Garland, Calif., to Sun Maid Raisin Growers of California, Fresno, Calif. No. 1,726,816. Sept. 3, 1929—The hot fruit is conveyed through a long horizontal cylinder by means of a screw conveyor, being cooled and sprayed with oil during its passage. The jacket which surrounds the cylinder for five-sixths its length, but has no connection with the cylinder, contains cooling water. The remaining sixth of the outer jacket has no connection with the cooling water section, but a number of perforations open it to the inner cylinder in which the fruit is passing. A refrigerant gas is introduced into this section of the apparatus and expands through the perforations, cooling the raisins to room temperature. Thus the fruit is first gradually cooled by the water-cooled walls, and then rapidly cooled by the gas. A header, also divided into two sections, is located above the main cylinders, connected with the inner cylinder as shown in the cross-section view. A common exhaust pipe which removes the hot, moist vapors is located above the header. The blade of the spiral conveyor is perforated, and fruit falling through the perforations causes a tumbling action which assists the process. Oil sprays are located at the beginning and end of the gentle cooling zone and the beginning of the rapid cooling zone.



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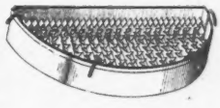
Soya Bean Flour as a Briquet Binder —Hugh F. Rippey and others, Seattle, Wash. No. 1,735,506. Nov. 12, 1929—A binder for carbonaceous briquets which is said to be strong, resistant to water, and smokeless, is made from soya bean flour, water and caustic soda. After the briquets made with this binder are dried, preferably at about 200° F., they can be transported without disintegration. The binder holds the particles together in the fire so that the briquets burn as a lump.

* * *

Yolk-Separating Device — Samuel Tranin, Kansas City, Mo. No. 1,727,493. Sept. 10, 1929—A semicircular strainer, designed as shown in the illustration, which is placed in the ordinary yolk-mixing churn, and through which the egg yolks are introduced into the churn. The sharp points on the bottom of the basket puncture the yolk membrane and allow the yolk to run through, while the chalazae, or "gristle," the membrane, and shreds of white and particles of shell are retained.



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Preserving Peanut Butter—James H. Beattie, McLean, Va., and Albert M. Jackson, Chevy Chase, Md. No. 1,731,647. Oct. 15, 1929—Rancidity and separation of oil in peanut butter upon storage is prevented, following the ordinary procedure of manufacture, by packing in sealed, airtight containers and heating by pressure steam to a temperature of 250 deg. F. Number 2 cans require processing for fifteen minutes, and other sizes in proportion to size. The process causes the product to stiffen, the amount of stiffening depending upon the length of treatment in the cooker.

Copies of Patents

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Reports of Government Bureaus Reveal Progress; Trend to Research Grows

THE TREMENDOUS AMOUNT OF WORK being done in more than a dozen distinct bureaus connected with the United States Department of Agriculture and the Department of Commerce cannot help but be of decided significance to the processor and manufacturer of foodstuffs. In this summary of reports of these bureaus for the fiscal year ending June 30, 1929, excerpts concerning outstanding achievements and forecasts are assembled.

Report of Secretary of Agriculture

It is probable that the total income from agricultural production for the crop year 1929-30 will equal, if it does not exceed, that of the 1928-29 season. Reduced yields due to drought seem likely to be more than offset by price advances.

Gross returns to livestock producers in the first eight months of the year were approximately $93,000,000 more than in the corresponding period in 1928, despite a decrease of 1,187,000 head of animals slaughtered under federal inspection.

The dairy industry is very stable. It is not showing any immediate prospect of marked expansion.

Expansion in the fruit and vegetable industry has been rapid since the war, as is shown by the fact that receipts of fruits and vegetables at eleven large cities have doubled in the last seven years. Competition resulting from an increased supply of fresh products all year round is felt very keenly by the canning industry. Accordingly canners are energetically striving to improve the quality of their output. To that end they are developing methods of buying raw products from the farmers on a quality basis rather than at flat rates per ton or bushel.

Under the agricultural marketing act, rapid progress in the co-ordination of co-operative marketing may be expected.

Total exports of agricultural products, excluding forest products, showed an increase of about 2 per cent over the previous fiscal year.

Food, Drug, and Insecticide Administration

The well defined policy of preventing infractions of the laws through co-operation of the industries concerned was adhered to in the (fiscal) year.

Experts of the administration have gone into many commercial canning plants to explain new methods for detecting the presence of wormy, moldy, or otherwise objectionable material in foods. In all foods and food products there were 499 seizures and 211 prosecutions.

It is estimated that more than 30,000 cans of milk and cream were excluded from entry to the country for such infractions of the law as high bacterial content, high temperature, improper tagging, and production under insanitary conditions.

A great improvement in the traffic in beverage materials was noted this year. Some abuses still exist, however, notably the traffic in new products. Thus many sirups sold as fruit flavored were found to contain very little fruit juice and to be "fortified" with "fruit flavor," much of which was synthetic.

Exaggerated and false claims based on the bran content have been rather generally made for cereal foods. Methods for the determination of bran in cooked and uncooked wheat products were devised, making it possible to take effective steps to remedy this condition.

Routine inspection of creameries showed that more rather than less high-moisture and short-weight butter was shipped in interstate commerce during the fiscal year than in preceding years. Constant supervision seems still to be necessary to prevent fraud in the sale of butter.

Some manufacturers (drug and drug products) have taken advantage of the general public interest in vitamins to exploit preparations as sources of vitamins when the facts do not warrant it. The administration has attempted to put a damper on unwarranted labelings of this character.

The principal difficulty encountered in the sale of salmon this year was caused by misbranding. Mackerel canned in California also was marketed invariably under labels which gave the impression that it was salmon. Many of these packers were induced to change their labels.

It was found that low-strength and flagrantly misbranded flavoring extracts were being put out by several firms.

The discovery that poultry unfit for food was being packed led to a sweeping survey of the industry, which revealed that culls from the killing houses sometimes consisted of birds that had died of disease or injuries, as well as those which because of age, bruises or deformities were unsuitable for table use. These culls were sold to firms putting up canned chicken products. Seizure action was immediately instituted.

The seasonal inspection of tomato-products canneries brought to light several new types of adulteration, notably the addition of thickening agents, such as gum. Catsup adulterated with gums and artificially colored closely simulates a high-class product. A co-operative federal and state inspection of tomato products stopped at the source the shipment of 75,000 cases of adulterated or misbranded pulp, puree and catsup put out by 21 factories.

In October, 1928, the proposed definition and standard for mayonnaise, which had been the subject of a public hearing, was revised and adopted by the food standards committee. The definition for meal as it refers to ground grain was amended and adopted. The committee also made revisions, which were approved, of the definitions for oil of cinnamon and oil of cassia and their extracts, and for ginger ale and sarsaparilla. Attention was given to definitions for jellies and preserves, for ice cream, and for whole-wheat flour, but definite conclusions on these topics were reserved. One informal hearing was granted to manufacturers on a proposal to define sauerkraut juice.

In April, 1929, the committee adopted proposed definitions for whole-wheat flour and for a so-called "bolted" or "scalped" graham flour or meal.

Bureau of Dairy Industry

A test for the heat stability of milk has been devised and is now being tried under commercial conditions.

A set of color standards through which the hue, brilliance and chroma of evaporated-milk can be determined has been devised. In connection with investigations on the keeping quality of dairy products a photochemical method for the determination of the resistance of fats to oxidation has been perfected.

Work on the effect of forewarming temperatures in making dried skim milk indicates that the higher temperatures produce the most satisfactory milk for ice-cream making.

Studies made at 67 country milk receiving and cooling stations showed that as the volume of milk handled increases, both the direct and indirect costs per 100 pounds tends to decrease. A study made at 35 plants to determine the total investment in buildings and equipment per hundred pounds of milk handled showed that this investment ranged from $247.91 in plants handling from 500 to 1,000 gallons daily to $65.32 in plants handling over 5,000 gallons of milk daily.

Bureau of Animal Industry

During the (fiscal) year a material increase in meat imports occurred. Those of cured and canned meats were more than 26,000,000 pounds greater than during the previous year, most of the increase being represented by the canned products.

As a result of numerous feeding experiments with rats, it was found that all samples of beef extract examined were good sources of heat-stable, water-soluble vitamin, generally designated in this country as Vitamin G.

The systematic campaign against tuberculosis in livestock was marked by a large increase in the number of counties that have completed the tuberculin testing of all cattle within their borders. The effectiveness of the campaign is seen in the smaller percentage of cattle and swine carcasses condemned for tuberculosis in federally inspected packing plants.

Bureau of Plant Industry

In the artificial coloring (by gas treatment) of citrus fruits in Florida,

investigations have shown that improper conditions, such as too high temperature, excessive doses of gas, and insufficient ventilation, adversely affect the subsequent keeping quality of the fruit and favor the development of molds, rots, and decays in transit and storage.

The establishment of date growing on a satisfactory commercial basis in the Southwest is the latest illustration of the possibility of bringing in new crops that do not compete with existing staples and so do not add to the problem of overproduction.

Studies on the utilization of Southern-grown peaches have developed methods of preparing and preserving peach pulp for use in ice cream and for other purposes which result in a very high-grade and acceptable product.

Studies have been made with solid carbon dioxide as a supplementary refrigerant, special attention being given to the effect of the carbon-dioxide gas on the fruit and fruit rots. The gas given off by the solid carbon dioxide has been found capable of causing practically complete inhibition of both the development of the rots and the softening of the fruit almost immediately upon the closing of the car or other container. There is a limit, however, to the period of exposure which the fruit will stand.

Bureau of Chemistry and Soils

The Bureau of Chemistry and Soils is actively prosecuting investigations and research upon 376 subprojects under 122 major lines of inquiry.

"Cane cream," a new product developed by the bureau from cane sirup made from low-purity juices, is now being produced commercially.

Experiments indicate that better grades of molasses may be produced by improved methods of clarification of juice without reducing the sugar yield.

A survey was practically completed on the utilization of cull sweet potatoes. Chemical and physical examination of sweet-potato starch was made and indicates that it is on practically the same basis as white-potato starch with respect to general characteristics and methods of utilization. This conclusion, however, is by no means final. In co-operation with the first sweet-potato starch factory to be established in the United States, much pertinent information was gained regarding the possible utilization of sweet-potato culls.

Marked progress has been made in the reduction of the losses of life and property resulting from dust explosions in grain-handling operations.

Important work has been accomplished during the past year on the effect of ethylene on the composition and physical condition of Bartlett pears to be used for canning and drying. If further tests indicate the practicability of this method of handling pears it appears probable that the method will be rather generally adopted, especially by the larger commercial canners of pears.

In the investigation on cake making, different grades of flour made from different classes of wheat were used, both alone and with the addition of 20 to 25 per cent of other substances—for instance, white-corn flour, gelatinized corn flour, various starches, soy-bean flour, and potato flour. Very successful results were obtained, especially with the use of corn flour and cornstarch. A mixture of wheat and soy-bean flour likewise made cakes of very good quality.

Evidence seems to point to the fact that the use of a small amount of flour made from slightly germinated grain or seed mixed with ordinary flour improves the baking value of the flour.

Bureau of Biological Survey

Increased co-operation with the states in predatory-animal and rodent control is evidenced by the promise of co-operative funds totaling $1,800,000 for the current year, as compared with $1,120,000 expended during the (fiscal) year just closed.

Bureau of Entomology

Fundamental investigations of insecticides for orchard and other uses have during the past few years been arranged largely to bear on the spray residue problem.

Damage by the Japanese beetle in the heavily infested district was as severe as in previous years and somewhat more widespread. A spray that is useful in controlling large numbers of the Japanese beetle was developed.

Commercial damage to the corn crop resulting from the work of the European corn borer remains small or almost negligible.

It has been found that the lethal effect of the combination of certain gases upon insects attacking grain and stored products is far greater than the effect of either one used alone.

Work has shown that a new fumigant, ethlyene oxide, is the best gas now available for treating foodstuffs. It is safe to use, non-injurious to foodstuffs, leaves no odor or poisonous residue, and is very effective in killing insects.

The most important work of the division during the year has had to do with the presence of the Mediterranean fruit fly in Florida. A spray formula has been developed which has proved exceedingly efficient in the eradication operations.

Bureau of Agricultural Economics

Through the use of economic information, the business of farm production and distribution is gradually being reorganized and redirected. New methods and practices to meet changing economic conditions are being developed more rapidly than ever before. Nearly 300 economic research projects now under way in the bureau are giving aid in solving many of the complex problems in agricultural marketing.

The bureau's market-news service this year was made practically nationwide in scope, by extension of the leased-wire system to more than 10,000 miles and the opening of several new offices in the South and Northwest.

Increasing use of the standard grades for farm commodities is being reflected in better quality of products and correspondingly higher market prices. Use of the bureau's shipping-point inspection service in which federal and state inspectors certify the quality of products shipped to market, is increasing.

Much educational work has been done by the bureau in reducing waste and losses in the marketing of perishable farm products.

Bureau of Home Economics

Research on the chemical composition of fresh vegetables has followed the work on fresh fruits and fruit juices published last year. Tables which will furnish reliable data on about 95 vegetables are now nearing completion. The examination of foods to determine their vitamin content has been continued in the nutrition laboratories in conjunction with studies designed to improve the technic used in these assays.

Office of Experiment Stations

During the year each state received for its experiment station the sum of $80,000 from the government. An official visit is made to these experiment stations annually for review and consultation.

More and more the research programs of the individual stations are becoming the product of design based on the important needs of the agricultural industry rather than chance circumstance.

Extension Service

By teaching the grading and packing of vegetables and fruits dairy and poultry products, the standardization of canned products, preserves, jellies, pickles, and baked goods, income-producing possibilities of the home farm were developed. In all, 144,290 homes were reported as having adopted improved practices in food preservation. The amount of food products which it was reported had been preserved consisted of 20,178,000 quarts of food canned, 1,098,000 pounds of fruits and vegetables dried, and 16,366,000 pounds of meat cured.

Bureau of Fisheries
Department of Commerce

At the present time statistics collected by the bureau reveal that our annual harvest of fishery products approximates 3,000,000,000 pounds, for which our 127,000 fishermen receive $113,000,000. The pack of canned fishery products in 1928 exceeded 617,000,000 pounds, valued at nearly $96,000,000. Fishery byproducts to the value of $14,880,000 were produced. The quantities of fish frozen exceeded 113,600,000 pounds; the largest on record. Over 65,000,000 pounds of packaged fresh and frozen fish, or three and one-half times the production of 1926, valued at nearly $10,000,000, were marketed. In 1928 our imports of fishery products were valued at nearly $59,000,000 and our exports at $21,000,000.

According to the most recent statistics available, the commercial fisheries of the United States are in a sounder position than at any time in their history.

NEWS *of the* MONTH

Co-operative Processing Part of Plan of Farm Board; Opposition Forecast

By Paul Wooton
Washington Correspondent

PROCESSING incident to marketing farm products forms an integral part of the Federal Farm Board's program of financing co-operative enterprise. Little emphasis has been placed to date on this feature of the Board's plans, but there is no telling where or how far they will lead, and food packers and canners are on the alert.

Probably the plainest statement that can be made at this time of the policy to be pursued by the Board is that co-operatives will be encouraged to do their own processing wherever this may be regarded as necessary to obtain for the growers a fair price for their raw products. There is no thought apparently that the co-operative will usurp the function of the meat packers, but other branches of the food industry have no such assurance.

So far the canners have not voiced their fears or lodged any protest against the Board's policy of extending its program of financial aid beyond the function of production. Headquarters of the National Canners' Association have been silent on the matter, but a statement may be forthcoming after the meeting of the board of directors on Jan. 20.

Although vitally affected by the course that the Board's program may take, the canners' organization is credited with entertaining the belief that an attempt to thwart the Board's program now would be premature and probably futile. It may be that watching from the side lines the controversy that is raging between the grain commission men and the Farm Board has led the canners to bide their time. Perhaps they appreciate that political pressure is a significant factor in the present situation. With next summer's congressional campaigns approaching, the Farm Board is making a frenzied effort to produce results. The fact that the whole membership of the House and one-third of the Senate will be decided at the polls next November commands more than idle interest from the administration in the progress that is made by the Farm Board in developing and financing the farmer-controlled co-operatives.

With no disposition to pass judgment beforehand, the canners are watching with interest the first excursion of the Farm Board into financing co-operative canners. Under this plan the Board will grant credits amounting to $1,920,000 to two co-operative corporations representing the sour-cherry producers of Michigan and Wisconsin, and Michigan fruit growers for the acquisition by construction or purchase of processing and marketing facilities. These advances are to be limited to 60 per cent of the appraised value of such facilities and are to be secured by first mortgages on the property.

Food Industries was founded in 1928 by the McGraw-Hill Publishing Company. From its inception Dr. H. C. Parmelee has been editor, assisted by S. D. Kirkpatrick and Arthur W. Allen, *ex officio*, and Robert Gordon Gould, Laurence V. Burton, Paul D. V. Manning, and R. S. McBride. During December, January, and February, 1929, Mr. Allen officiated as executive editor.

With the March issue Mr. Gould was made managing editor and has since served in that capacity. In June, Earl D. Stewart replaced Dr. Manning as Pacific Coast editorial representative. During October, E. Scott Pattison was made editorial assistant. The foregoing staff is augmented by part-time services of Louis C. McCarthy.

ASIDE from the Senate lobby investigating committee's revelations concerning the more or less maladroit activities by concerned interests in regard to duties on sugar, the status of the tariff revision on foodstuffs has undergone virtually no change, so far, since the regular session of the 71st Congress began. The Senate's pre-holiday work on the tariff bill had to do with only a few items in the schedule covering wool and manufactures of that product.

In general the Senate is expected to leave food duties largely as they now are in those portions of the bill which it has considered. Those portions comprehend all major food products except sugar.

The tortuous sugar schedule remains the most exciting issue as to rates in the revision proceedings. Its difficulties have been expanded considerably by disclosures brought about by the Senate committee investigating lobbying. However, the committee's disclosures anent the sugar tariff lobbyists probably have been more interesting than important, and the disclosures are reflective perhaps more of stupidity or ignorance than of invidious designs on the part of the sugar lobbyists.

Each of these groups has hurt more than helped its cause. The last pre-holiday disclosures related to the activities of the American-Cuban group and have aspects somewhat more sensational than prior revelations as to other groups. The American-Cuban group has borne the major burden of lobbying against duty increases and at present it probably is in most disfavor. But the matter of disfavor as the result of lobbying disclosures is, as between groups, one which varies only in degree. It is unlikely, moreover, that final action as to sugar duties will be governed by disclosures concerned with the ineptitudes of individuals. The odds rather favor no change in those duties.

If the Senate concentrates, as it expects to do, on the tariff bill, revision will be speeded somewhat. The job is not likely to be finished before spring, and it is not yet reasonably assured that, in its present form, it ever will be finished at all—that is, to the extent of a more or less completely new tariff law being put on the books at this time.

Refrigerating Engineers Discuss Foodstuffs

The growing consciousness of the possibilities of quick-freezing was well illustrated by the prominence and interest which this subject received at the twenty-fifth anniversary meeting of the American Society of Refrigerating Engineers held in New York early in December. In discussing the future of refrigeration, S. C. Bloom, of Chicago, one of the pioneers in this field, emphasized the savings which will accompany the delivery of perishables to the customer in the frozen state. Especially in the meat-packing industry, according to Mr. Bloom, will these benefits accrue, and a potential reduction of 3½ cents per pound in the cost of preparing and distributing meat is indicated.

Clarence E. Birdseye told the engineers of the value of corrugated containers for shipping frozen products. The ordinary corrugated carton, with liners of corrugated cardboard or strawboard, has proved the equal of cork or balsa wood for shipping such products, he said. The difficulty in shipping them, according to Mr. Birdseye, lies not so much in the possibilities of their thawing out as it does in the danger of slow freezing if partly thawed material in insulated con-

tainers is returned to a lower temperature after shipment.

A new hydrated dry-ice product, known as "Hydrice," was the cause of great interest. Walter S. Josephson demonstrated the manufacture of this material before the group. Among the advantages which the hydrated product possesses over ordinary dry ice is the fact that it does not act as a dehydrating agent upon the product with which it is packed. Furthermore, the coating of frost which forms a blanket over the solid carbon dioxide acts as an insulator and slows the rate of heat absorption, making the material suitable for general refrigeration of unfrozen products at temperatures of 38 to 40° F. for considerable periods of time.

Milk and Mayonnaise Defined; Ice Cream Ruling Voided

DEFINITIONS of milk, mayonnaise, and coffee, as revised and amended by the Food Standards Committee of the U. S. Department of Agriculture at its October meeting, were recently approved by the Secretary of Agriculture. They are now official for use in the enforcement of the Federal Food and Drugs Act.

The approved definitions are as follows:

MILK is the whole, fresh, clean lacteal secretion obtained by the complete milking of one or more healthy cows, excluding that obtained within 15 days before and 5 days after calving, or such longer period as may be necessary to render the milk practically colostrum-free. The name "milk" unqualified means cow's milk.

GOAT'S MILK AND EWE'S MILK are the whole, fresh, clean lacteal secretions free from colostrum, obtained by the complete milking of the healthy animals, and conform in name to the species of animal from which they are obtained.

SKIM-MILK, SKIMMED MILK, is that portion of milk which remains after removal of the cream in whole or in part.

PASTEURIZED MILK is milk every particle of which has been subjected to a temperature not lower than 142° F. for not less than 30 minutes, and then promptly cooled to 50° F. or lower.

COFFEE is the seed of cultivated varieties of *Coffea arabica, C. liberica,* and *C. robusta.* (a) Green coffee, raw coffee, unroasted coffee, is coffee freed from all but a small portion of its spermoderm and conforms in variety and in place of production to the name it bears. (b) Roasted coffee, "coffee," is properly cleaned green coffee which by the action of heat (roasting) has become brown and has developed its characteristic aroma.

MAYONNAISE, MAYONNAISE DRESSING, MAYONNAISE SALAD DRESSING, is the clean, sound, semi-solid emulsion of edible vegetable oil, egg yolk or whole egg, a vinegar and/or lemon juice, seasoned with one or more of the following: salt, sugar, spice commonly used in its preparation. The finished product contains not less than 50 per cent of edible vegetable oil, and the sum of the percentages of oil and egg yolk is not less than 78.

The Secretary of Agriculture also approved the recommendation of the committee that the present definition of ice cream be deleted, on the ground that it is not enforceable in interstate commerce because the subject has been specifically covered by laws in the various states and that the definition does not represent modern commercial practice in the manufacture of ice cream.

COMING EVENTS

JANUARY

6–8—Northwestern Canners' Association, Seattle Wash.
15–16—New England Association of Ice Cream Manufacturers, Boston.
20–24—Canning Machinery and Supplies Association (meeting and exposition), Chicago.
20–24—National Canners' Association, Chicago.
20–24—National Food Brokers' Association, Chicago.
21–23—National Preservers' Association, Chicago.
21–23—National Pickle Packers' Association, Chicago.
27-31—International Heating and Ventilating Exposition, Philadelphia.

FEBRUARY

26–March 1—Canners' League of California, Del Monte, Calif.

MARCH

17–20—American Society of Bakery Engineers, Chicago, Ill.

TRADE NOTES

AMALGAMATED SUGAR COMPANY, operating beet-sugar plants in Utah, Idaho and Montana, may be merged with the American Beet Sugar Company. The merger is indicated by the application of the latter company to list 62,271 shares of common stock to be exchanged for the outstanding stock of the Amalgamated company.

ATLANTIC COAST FISHERIES COMPANY, New York City, has presented a scholarship to the school of fisheries of Dalhousie University, Halifax, N. S. It is open to graduate and undergraduate students with a thorough grounding in physics, chemistry and mathematics.

BATTLE CREEK BREAD-WRAPPING MACHINE COMPANY has absorbed the Johnson Sealer Company, Battle Creek, Mich. George Bent, formerly owner of the latter concern, has retired.

CARNATION MILK PRODUCTS COMPANY, of Seattle, Wash., has acquired the Broadview and Pine Creek dairies, both pioneer concerns of Spokane, Wash., on an exchange of stock basis. Considerable expansion has been planned for the Broadview plant.

FOREMOST DAIRY PRODUCTS and the Southwest Dairy Products have agreed to consolidate. The combined organization will be the largest dairy enterprise in the South, with an annual aggregate sales volume in the neighborhood of $15,000,000.

GROCERY STORE PRODUCTS, INC., New York City, as a result of recent elections, now has the following permanent board of directors: President, James M. Hill; chairman, Robert M. McMullen; treasurer, H. H. Mills; secretary, B. M. Gordon; George K. Morrow (chairman, Gold Dust Corporation); Oliver G. Jennings, George S. Brewster, Edward H. Jacob.

OBITUARY

F. WILLIAM HEIDE, affiliated with his brother, Henry Heide, in the manufacture of candy for the past 45 years, died recently at his home in New York City after a year's illness. He was 79 years old.

JOHN LANE, widely known along the Great Lakes and the Atlantic seaboard, and prominent in the grain industry, died at Buffalo on Dec. 9. Mr. Lane had been manager of many of the larger elevators in the Buffalo district.

FRANK LIMBERG, inventor of a method of producing an acid-resisting enamel used widely in the packing and canning industries, and owner of the Limberg Enameling Works, Cincinnati, Ohio, died at his home in Cincinnati on Nov. 24. Mr. Limberg, who was 64 years old, had been ill since August.

FRANK E. LOWENSTEIN, president of Norris, Inc., Atlanta candy company, died at his home in Atlanta, Ga., on Dec. 18, following a long illness. Mr. Lowenstein was 49 years old, and a leader in civic activities. He was influential in building the organization which he headed from a small business to one of the greatest enterprises of this kind in the South.

ROY NELSON, of Marshfield, Mo., long the foremost figure in the tomato-canning industry in the Ozark region, died recently after a long illness. Mr. Nelson owned fourteen canning factories and farms totaling nearly 3,000 acres, the value of the 1929 pack of his plants being estimated at $650,000. He was the first to make a success of large-scale tomato canning in that part of the country. Mr. Nelson was 46 years old at the time of his death; he was born in Pennsylvania, but had lived in Missouri since childhood.

EDWIN C. SUTTON, one of the foremost figures in the ice cream industry, died on Dec. 5 at his home in Buffalo. Mr. Sutton, who was 57 years old, had been connected with ice cream manufacture since a boy. When the company of which he was president merged with the General Ice Cream Company in 1926, he became a member of the executive committee and the board of directors. He retired from active work in the industry two years ago.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery—Fischer Baking Co., 242 Livingston St., Newark, N. J., awarded contract for a 1 story, 100 x 125 ft. bakery at Railroad and 5th Aves. to F. D. Trainer & Son, Inc., 12 Smith St., Irvington. Estimated cost $100,000.

Bakery—Franklin Bakery, 17 Nestor St., Franklin, N. J., will build a 2 story, 28 x 185 ft. bakery. Estimated cost $40,000. J. De Rose, 119 Ellison St., Paterson, N. J., is architect. Work will be done by separate contracts. Former contract rescinded.

Bakery—Frank's Hot Shops, C. A. Franke, 119 West Capitol Ave., Little Rock, Ark., will soon award contract for the construction of a 1 story, 75 x 150 ft. bakery at Third and Ringo Sts. Estimated cost $100,000. W. E. Long & Co., 155 North Clark St., Chicago, Ill., are architects.

Bakery—Kingston Cakes Co., Kingston, Pa., will soon award contract for the construction of a bakery. Estimated cost $150,000. McCormick Co. Inc., 121 South Negley Ave., Pittsburgh, Pa., is architect.

Bakery—E. Levitt, 3234 White Plains Rd., New York, N. Y., will build a bakery at 241st St. and Barnes Ave. Estimated cost $30,000 to $40,000. F. J. Ross, 4200 White Plains Rd., New York, is architect. Work will be done by separate contracts.

Bakery—Mueller & Krecke, 1001 American Radiator Bldg., Detroit, Mich., Archts., will receive bids about Jan. 10 for the construction of a 2 story, 60 x 120 ft. bakery on Tireman Ave., for owner, c/o architects. Estimated cost $50,000. Equipment will be required.

Bakery—Tasty Baking Co., 2801 Hunting Park Ave., Philadelphia, Pa., awarded contract for the construction of a 6 story, 60 x 110 ft. bakery at Hunting Park and McMichael St., to Turner Construction Co., 1700 Walnut St., Philadelphia. Estimated cost $200,000.

Biscuit Factory—Interests represented by T. A. Box, Altadena, Calif., plans the construction of a 275 x 450 ft. factory at Baldwin Park. Williams Biscuit Co., Chicago, Ill., is lessee.

Bottling Plant—Coca-Cola Bottling Co., 1115 Clark Ave., St. Louis, Mo., awarded contract for a 1 and 2 story, 130 x 250 ft. bottling plant at 2948 North Market St. to Boaz-Kiel Construction Co., 1207 Ambassador Bldg., St. Louis. $125,000; also 1 story, 96 x 100 ft. bottling plant at Hamilton, Ont., to Frid Construction Co. Ltd., 6 Hugheson St., Hamilton. $50,000.

Brewery—J. Ruppert, 1639 3rd Ave., New York, N. Y., plans the construction of a brewery, storage building, etc., at 1535 3rd Ave. Estimated cost $120,000. A. Evans, 455 7th Ave., New York, is architect.

Grape Fruit Juice Plant—Shay Products Co., c/o J. H. Shay, Donna, Tex., plans to remodel grape fruit juice plant, also install equipment at Val Verde. Private plans.

Cannery—H. B. Body Co., 19th and Livingston Sts., Oakland, Calif., will build a cannery and boiler house on West 66th Ave. Estimated cost $100,000.

Cannery—Filice & Perrelli, Gilroy, Calif., awarded contract for the construction of a 1 story cannery at Richmond to W. Radtke, Gilroy. Estimated cost $200,000.

Canning Plant—Interests represented by M. A. Travers, Beach Rd., Watsonville, Calif., plans the construction of a canning plant. Estimated cost $250,000, including equipment.

Canning Plant Addition—Minnesota Valley Canning Co., Blue Earth, Minn., is having plans prepared for addition to canning plant including power plant. Estimated cost $450,000. R. W. Richardson, 116 East 4th St., St. Paul, is engineer.

Casein Plant—Jerome Co-Operative Creamery Co., Jerome, Idaho, awarded contract for the construction of a casein plant at Rupert, to J. E. White & Co., Rupert, Idaho. Estimated cost $40,000.

Creamery—Beach City Creamery, W. C. Cavanaugh, Mgr., Santa Cruz, Calif., plans the construction of a 70 x 100 and 32 x 102 ft. creamery on Soquel Ave.

Creamery Plant Improvements — Laredo Creamery Inc., c/o J. O. Walker, Laredo, Tex., plans improvements to creamery plant, including machinery for butter making, ice cream making and pasteurized milk. Private plans.

Dairy Plant—Foremost Dairy Products Co., Inc., c/o B. G. Lewis, Pres., Jacksonville, Fla., is having plans prepared for the construction of a dairy building on Ponce de Leon Ave., Atlanta, Ga. Estimated cost $500,000. H. Laisen, c/o owner, is engineer.

Dairy Building — Missouri Survey Commission, St. Louis, Mo., recommended appropriation of $8,000,000 for a group of buildings, including dairy building, etc., to be expended within ten years, for Missouri University, Columbia, Mo.

Dairy Plant—F. J. Ricker, 685 Hudson Ave., West New York, N. J., Archt., will receive bids about Jan. 3 for the construction of a 2 story dairy plant at 565-67-69 30th St., for E. Hohneker, 563 30th St., North Bergen, N. J.

Dairy Building—Mount Dennis Dairy Ltd., Chryessa St., Mount Dennis, Ont., is having plans prepared for the construction of a 2 story dairy building at Toronto. Estimated cost $150,000. Craig, Madill & Lauden, 96 Bloor St. W., Toronto, are architects.

Dairy Plant Addition—Hansen Dairy Co., 915 North Mansfield Ave., Los Angeles, Calif., had plans prepared for a 1 story, 100 x 134 ft. addition to dairy plant. C. O. Dale, 1045 South Wall St., Los Angeles, is architect.

Ice Cream Factory—Fairmont Creamery Co., 12th and Jones Sts., Omaha, Neb., is receiving bids for the construction of a 4 story, 86 x 171 x 260 ft. ice cream factory at West 17th St. and Wiley Ave. Estimated cost $600,000. F. V. Thomas, c/o owner, is architect and engineer.

Ice Cream and Milk Plant—Louisiana Ice & Utilities Co., 402 Securities Bldg., Baton Rouge, La., awarded contract for the construction of a 2 story, 50 x 60 ft. ice cream and milk plant to A. C. Stewart, 810 East Blvd., Baton Rouge. Estimated cost $24,800.

Ice Cream Plant—Marioni Ice Cream Co. Inc., Barraclough Ave., Hamden, Conn., had plans prepared for the construction of a 2 story, 45 x 60 ft. ice cream plant. Estimated cost $40,000. H. S. Cannici, 109 Church St., New Haven, is architect.

Ice Cream Factory—F. Sanders Confectionery Co., 2465 Woodward Ave., Detroit, Mich., plans the construction of a 2 or 3 story, 480 x 575 ft. ice cream factory on 12th St. Architect not selected.

Milk Plant—Milk Products Co., C. A. Harpster, Secy., Hiawatha, Kan., will soon receive bids for the construction of a 1 and 2 story, 69 x 150 ft. milk plant. Estimated cost $200,000. Douthitt Engineering Co., 100 West Monroe St., Chicago, Ill., is engineer.

Milk Plant—Texas Milk Products Co., c/o D. B. Short, Mgr., Marshall, Tex., awarded contract for the construction of a milk plant at Mount Pleasant, Tex. to O. L. Crigler, Mount Pleasant. Estimated cost $200,000.

Cold Storage Plant—Central Power & Light Co., Frost Bldg., San Antonio, Tex., will soon award contract for the construction of a cold storage plant at Harlingen. Estimated cost $75,000. J. Marriott, Frost Bldg., San Antonio, is engineer.

Cold Storage Plant Addition—U. S. Cold Storage Co., 500 East 3rd St., Kansas City, Mo., plans the construction of a 5 story addition to cold storage plant. Private plans.

Cold Storage Warehouse—Scobey Fireproof Storage Co., c/o F. E. Scobey, Pres., 315 North Medina St., San Antonio, Tex., will receive bids after Jan. 1 for the construction of a 4 story, 100 x 166 ft. cold storage warehouse on Medina St. Estimated cost $200,000. Engineering Service Corp., Post-Dispatch Bldg., Houston, is architect and engineer.

Cold Storage Terminal—Mutual Income Properties, Union League Bldg., Los Angeles, Calif., awarded contract for the construction of a 10 story cold storage terminal at O'Farrel and Sepulveda Sts., San Pedro, to R. Brown, 516 Union League Bldg., Los Angeles. Estimated cost $1,250,000.

Ice Plant and Creamery—O. D. Dillingham, Abilene, Tex., awarded contract for the construction of a 20 ton ice plant and creamery at Coleman, to Edgerton & Furry, Coleman, Tex. Estimated cost $32,000.

Ice Manufacturing Plant and Storage Building—Walker Coal & Ice Co., 102 Thomas St., Worcester, Mass., awarded contract for the construction of a 1 story, 50 x 135 ft. ice manufacturing plant and storage building on Chadwick Sq. to E. D. Ward Co., 82 Foster St., Worcester.

Ice Plant—Boston Ice Co., 11 Deerfield St., Boston, Mass., will receive bids about Jan. 2 for the construction of 120 ton ice plant on Eagle St., East Boston. Estimated cost $80,000. C. L. Wier, 13 East 37th St., New York, N. Y., Archt. and engineer.

Ice Plant—Knickerbocker Ice Co., 41 East 42nd St., New York, N. Y., will soon receive bids for the construction of a 54 x 85 ft. ice plant at Proctor St. and Edsall Ave., Glendale. C. L. Weir, 13 East 37th St., New York, is architect.

Ice Plant—Owner, c/o A. W. K. Billings, Jr., 80 Boylston St., Boston, Mass., is receiving bids for the construction of a 1 story, 75 x 125 and 239 x 335 ft. ice plant at 200 Geneva Ave., Dorchester. Estimated cost $100,000.

Ice Plants—National Service Co., 150 Congress St., Boston, Mass., is having plans prepared for the construction of ice plants at New London and Hartford, Conn., also Somerville and Worcester, Mass. Estimated cost to exceed $40,000 each. R. B. Engineering Co., 11 West 42nd St., New York, N. Y., is engineer.

Ice Plant Addition—Rubel Coal & Ice Co., 937 Fulton St., Brooklyn, N. Y., will receive bids about Jan. 15 for the construction of an ice plant at India Wharf and Conover St. Estimated cost $40,000. H. J. Nurick, 44 Court St., Brooklyn, is architect and engineer.

Flour Mill—Birdsey Flour Mills, R. Birdsey, Secy., 9th St., Macon Ga., awarded contract for construction of a 3 story, 55 x 110 ft. mill to C. W. Jones & Son, Grand Bldg. Estimated cost $35,000.

Grain Elevator—Dept. of Trade & Commerce, Parliament Building, Ottawa, Ont., awarded awarded contract for the construction of a grain elevator at Prescott, to Atlas Construction Co., 37 Belmont St., Montreal, Que. Estimated total cost $5,000,000.

Grain Elevator—Lake of the Woods Flour & Milling Co., Ltd., St. Sacrament St., Montreal, Que., plans the construction of a grain elevator at Manitou, Man. Estimated cost $100,000. This corrects report in August issue.

Grain Elevator — Port Commission, Tacoma, Wash., awarded contract for the construction of a grain elevator and shipping gallery, to Albertson-Cornell Bros., Tacoma, $520,956, also dock to Tacoma Dredging Co., Tacoma, $150,000.

Sweet Feed Plant—Miracle Feed Mill, c/o F. T. Boswell, Bishop, Tex., awarded contract for the construction of a 1 and 2 story, 30 x 40 and 24 x 36 ft. sweet feed plant, to C. Michalk, Bishop. Contract for machinery and equipment including 24 in. feed cutter, No. 3 super-miracle ace mill, two small elevators, molasses mixer, two feeders, etc., to Anglo-American Mill Co., Owensboro, Ky.

Warehouse—Fisher Flouring Mills, Harbor Island, Seattle, Wash., awarded contract for the construction of a 1 story, 100 x 200 ft. warehouse and shipping gallery to Tuefel & Carlson, Skinner Bldg., Seattle. Estimated cost $100,000.

Soy Bean Products Factory—Canadian Soy Bean Products Ltd., F. Steele, Mgr., King St., Ingersoll, Ont., taking over old factory building and will install plant for the manufacture of soy bean products. Interested in prices on complete equipment.

Bologna Factory—F. Hertler, 118 Lawrence St., New Haven, Conn., is having revised plans prepared for the construction of a 2 story, 50 x 150 ft. bologna factory including cold storage plant on State St. Estimated cost $45,000.

Cheese Factory—Kraft Phoenix Cheese Co., H. S. Brown, Gen. Mgr., 962 Battery St., San Francisco, Calif., is having plans prepared for the construction of a cheese factory at Garland, Utah. Estimated cost $45,000.

Coffee Plant—W. S. Quimby Co., 291 Atlantic Ave., Boston, Mass., plans the construction of a coffee manufacturing plant on Mt. Vernon St., Dorchester. Estimated cost to exceed $40,000. Architect not selected.

Cream of Tartar Factory—S. Castorina, Lodi, Calif., is having plans prepared for the construction of a 4 story cream of tartar factory, also additional unit to distillery plant. Estimated cost $200,000. A. C. Martin, Higgins Bldg., Los Angeles, is architect.

Food Products Plant—Bluefield Food Products Co., 3400 West 48th Pl., Chicago, Ill., awarded contract for masonry, etc. for a 1 story, 50 x 114 ft. addition to food products plant at 3400-12 West 48th Pl. Estimated cost $25,000.

Packing Plant (Citrus and Fruit)—H. H. Banker, et al., West Brownsville, Tex., will soon award contract for the construction of a citrus and fruit packing plant, including equipment. Estimated cost $25,000. Private plans.

Packing Plants (Citrus Fruit)—Valley Fruit Exchange, c/o W. E. Hodges, Gen. Mgr., Pharr, Tex., is having plans prepared for the construction of six packing plants during 1930, located throughout Rio Grande valley. Private plans.

Packing Plant (Meat) Addition—Madison Packing Co., Madison, Ill., will build a 1 and 2 story, 26 x 39 and 48 x 100 ft. addition to meat packing plant 1039 Greenwood Ave. Bonnell-Thotz Co., 1519 North Grand Blvd., St. Louis, Mo., is architect. Work will be done by separate contracts.

Packing Plant (Meat) Addition—White Packing Co., Montgomery, Ala., is having preliminary sketches made for addition to meat packing plant. H. P. Henschien, 1637 Prairie Ave., Chicago, Ill., is architect.

Packing Plant Addition—Circle Packing Co., 314 Winstanley Ave., East St. Louis, Ill., plans the construction of a 2 story, 32 x 85 ft. addition to packing plant. Bonnell-Thotz Co., 1515 North Grand Ave., St. Louis, Mo., is architect.

Packing Plant—Jacob Dold Packing Co., 21st and Lawrence Ave., Wichita, Kan., awarded contract for remodeling packing plant, to G. C. Christofer & Sons, 1220 Blaine St., Wichita. Estimated cost $250,000.

Packing Plant (Almond and Walnut)—Litinsky Co., 20th St., Chico, Calif., had plans prepared for the construction of a 2 story almond and walnut packing plant. Estimated cost $40,000. Private plans.

Produce Plant—Tanner Bros., 633 Beacon St., San Pedro, Calif., is having plans prepared for the construction of a 2 story, 80 x 125 ft. produce plant at 7th St. and Pacific Ave. Estimated cost $50,000. F. L. Stiff, 1101 Detwiler Bldg., Los Angeles, is architect.